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CHAPTER I

Terrain Compartments

"I have ordered the army to concentrate at Quatre Bras," replied the Duke. "But we shall not stop him there, and if so, I must fight him here." As he spoke, his thumb-nail traced a line along the ridge in front of Waterloo. It was a strong position, which he had noticed first nearly a year before in the course of his survey of the defences of the new Kingdom of the Netherlands. Then he went off to bed; . . ."
—(June 16, 1815) The Hundred Days, by Philip Guedalla.

Even many centuries before Waterloo, ridges and the high ground that topped them had been looked upon as strong positions for battle. And modern warfare has brought no change to this general conception. For today, in fact, we seize commanding terrain with even more avidity than in the past. We have need of higher altitudes for observing the effect of long-range fires and for the use of supporting weapons in the attack. And with these same weapons and modern refinements of ground organization we now make our defense of high ground the equivalent in strength of stout fortifications, which are sometimes impregnable to direct attack. This new strength given to hills and ridges by the machine gun (using that term to include all automatic or semi-automatic weapons of small caliber) was, of course, the major lesson of the World War. Chemin des Dames, Mery-Belloy, Messines, Vimy, and many another ridge and hill bore witness to this truth.

In this basic circumstance of warfare, the years since 1918 have made little difference. We still find ourselves facing the same problem. The enemy, let us say, holds

Ridge Red (Figure 1), and we have advanced as far as Ridge Blue.

With no more data to go on than that, and making any assumptions we like as to size of the units involved or their position as parts of larger forces, so long as we as-

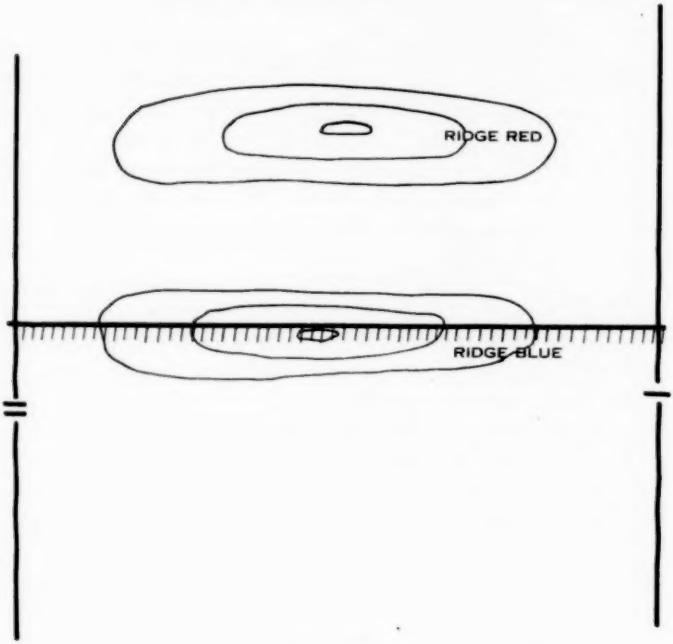

FIGURE 1

sume the opposing armies to be fairly equal in armament and fighting ability, we can see that Ridge Red is going to make trouble for the Blues. This then, in very general terms, is the old puzzle for which we continue to seek the best solution.

Up to now, no Edison of warfare has found the magic key. But in recent years a more thorough method of analyzing this and other problems involving terrain has con-

siderably clarified our understanding of them, and has at least suggested more sensible lines of approach toward a correct solution. This new method of looking at old problems includes particularly the division of terrain into compartments, which we shall now investigate at some length.

As a point of departure let us examine more closely the piece of ground containing Ridges Blue and Red, which are shown in Figure 2 as before, except that we have re-

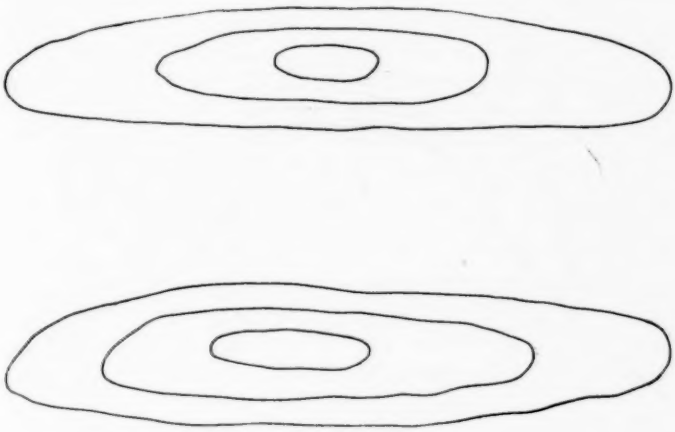

FIGURE 2

moved the signs of military occupation. At first thought these two ridges seem normal enough in their representation. They appear to be two simple parallel ridge lines such as we often see in gently rolling country. But taking nothing whatever for granted, let us stop here to ask ourselves: Do we actually see such terrain?

Indeed we do not. On the whole Gettysburg-Antietam Topographical Map, there are not two such ridges rising with clean smooth contours above the surrounding level country. Only very rarely does nature form such ground.

Even those ridges that appear rounded and regular to the eye are almost invariably made up of noses and spurs, and cut with gullies and stream beds, not to mention the differences due to works of man such as roads, walls, buildings, and ditches; and the boundless variations of woods, underbrush, and crops. It is not even necessary to refer to a map to realize that these things are true. They are,

FIGURE 3

in fact commonplaces to all who are accustomed to the use of carefully contoured maps.

It is the study of these irregularities—especially the noses and spurs that jut out from high terrain—that forms the basis of terrain compartmenting. A terrain compartment, to use a simple French definition, is an area, considered as one faces the enemy, that is bounded both on the front and sides by the visible horizon. Thus in Figure 3, from the viewpoint of a man at *A*, the irregular high ground to his front forms a terrain compartment whose visible horizon follows the heavy, black line.

It goes almost without saying that all ground, except flat plains and desert and swamp lands, can be divided into compartments; and that these compartments are of all sizes, large compartments containing, or being made up of, many small ones. What may not be so readily apparent is that terrain compartments do not necessarily align themselves along any given direction. In other words, we rarely find a large area of which we can say that the terrain compartments all, or most of them, face or run in a single direction.

The reason for this is more apparent as we examine Figure 4. Here we have a schematic diagram of a stream and its branches (Gilbert Creek, Fort Benning), with the terrain compartments designated by heavy, generally semicircular lines. Taking the area as a whole, we see that the various compartments extend in almost as many different directions as there are compartments, considering the direction of extent to be as shown by the arrow in Figure 3. But we do find, however, that within limits, compartments of the same general size are often found approximately side by side, as along the right hand side of the valley. This is shown more clearly perhaps in Figure 5, which indicates the compartments formed by the spurs of ground extending from both sides of a single ridge (Frey Ridge, Fort Benning).

A further examination of terrain compartments also brings out the fact that they are often long and narrow, and that if we face up such a compartment (as in Figure 6), the high ground forming its two sides is of much greater importance—at least until we approach the head of the valley—than that which forms its end. In the long narrow valley shown in Figure 6, the long spurs rising from both sides of the stream are by all odds its principal features; whereas the short connecting link, *A*, is, considering this one compartment alone, of little importance.

It is also evident that compartments of this long narrow type may be many miles in length, and that sometimes only their sides may be of military importance. This fact has been the basis of a broader definition of the terrain

compartment than that of the French, which was given above: "A terrain compartment is an area of terrain en-

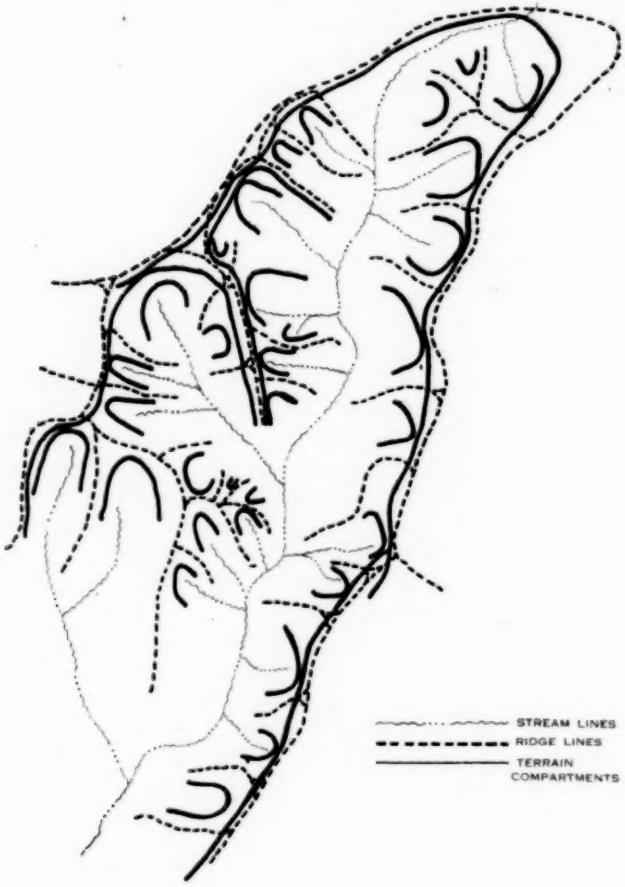

FIGURE 4

closed on at least two sides by terrain features that limit terrestrial observation and direct fire into the included

area. The limiting features may be ridges, woods, villages, or any other features which afford defilade."

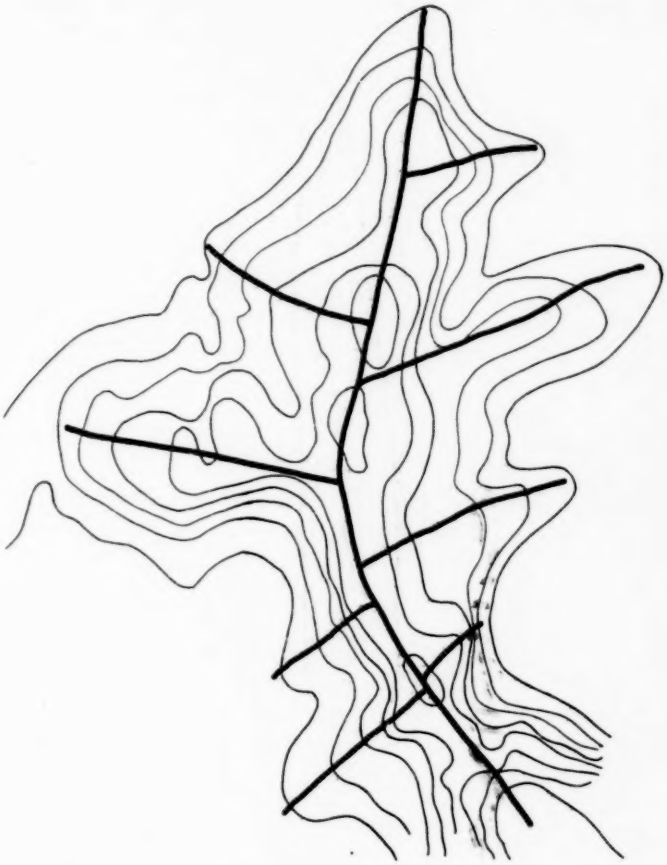

FIGURE 5

But in bringing these long terrain compartments or corridors, consisting mainly of parallel spurs or ridges, within our general conception of the terrain compartment, we

must not forget that, like other compartments, they too are usually cut up into smaller ones in a manner similar to that shown in Figure 4. It is this whole conception that is important. For if we get to thinking of all compart-

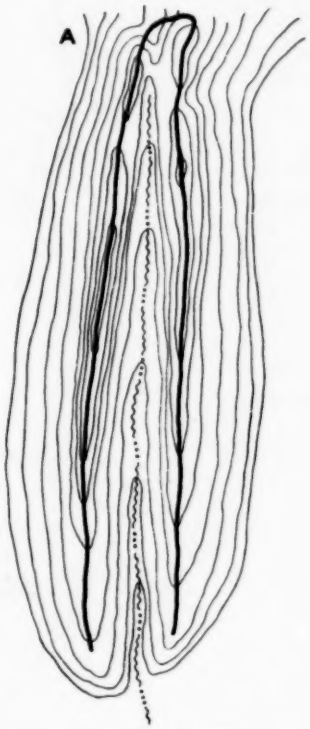

FIGURE 6

ments merely as corridors, and disregard the smaller irregularities, we are simply drifting back again to the conception of terrain in Figure 1—in which we let ourselves visualize merely one regular ridge line facing another. The terrain corridor is sometimes highly important; but the importance of one type of terrain compartment should

not blind us to the quite as great, if not greater, importance of other types.

And now that we have discussed what terrain compart-

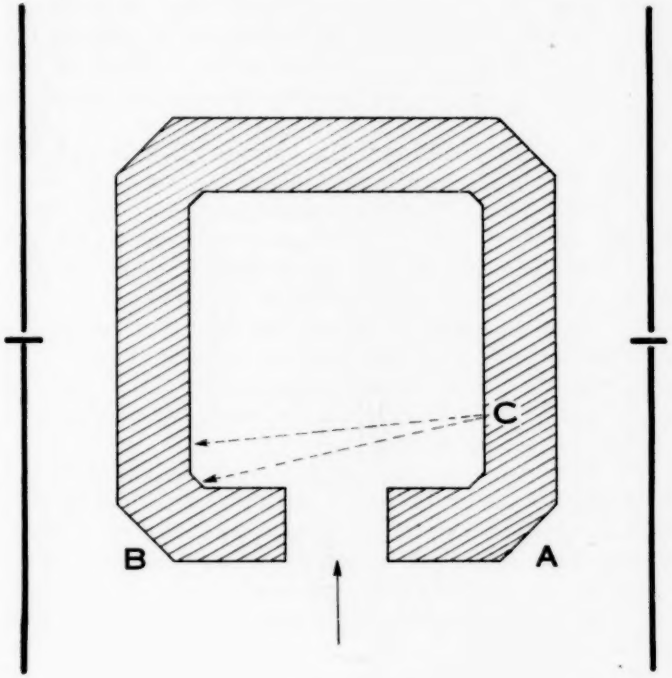

FIGURE 7

ments are as ground, let us look into their military significance more closely. We can bring this out most clearly, perhaps, if we first study a hypothetical and somewhat exaggerated example of a terrain compartment.

Let us imagine (Figure 7) that a U-shaped, cuartel-type barracks, such as that occupied by the 29th Infantry at

Fort Benning, lies in the zone of advance of an attacking infantry rifle company. Obviously, to march the company into the interior parade of the cuartel before the building itself were captured would expose the attacking unit to observed cross fire from a concealed and protected enemy in the barracks, behind strong walls, and with ample protected communications. Neither could the rifle company afford to pass by the barracks, leaving it occupied by the enemy who could, from his strong position, attack by fire and movement against the flank of the company as it advances.

On the other hand, once the barracks is captured, the parade within the enclosing building forms a sheltered area in which the attacking company can reorganize for a further advance. This advance, moreover, can be covered by fire and observation from the barracks, which, in turn, forms a formidable obstacle to a counterattack.

We see, easily enough, that this artificial compartment is of great strength, both in the defense and the attack. And now, at some risk of becoming involved in a discussion of sieges and fortifications, let us see how an attacking unit would go about its capture.

We have seen that any attempt to enter the area enclosed by the barracks would be folly. And hardly less foolish would be an attempt to pass by either flank since the flanking movement must expose itself continually to protected fire from the roof and upper floors of the building. Hence, if the attack is to progress, the building must be taken.

What must be gained first is a foothold. A portion of the building's perimeter that is least exposed to supporting fires from other parts, such as *A*, must first be rushed, a foothold obtained on all floors, and then the fight pressed less at disadvantage at the enemy's own level. Once the roof and upper floors are reached in one small section of the building, fires can be brought to bear on other sections. And the farther the attackers progress along one side of the U-shaped barracks, the more such fires can be placed across upon the other leg. From *C*, for example, fires can be

placed upon the rear of *B* to the discomfiture of the enemy at that point and to the great assistance of a possible attack directly upon *B*.

Thus, from the assumption of somewhat artificial conditions, we see in a measure why terrain compartments are

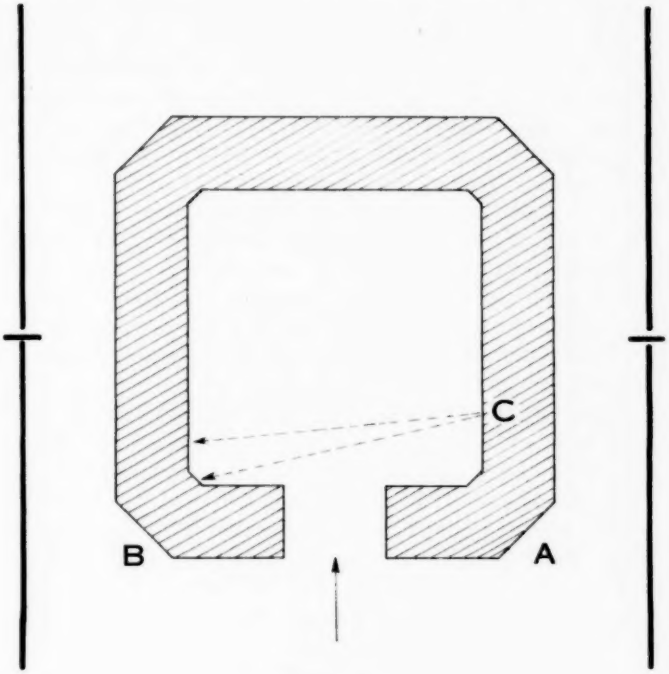

FIGURE 7

important. In Figure 8 we have a strong natural compartment (Riley Ridge—Ebbert Hill—Davidson Hill area, Fort Benning) which is actually about three times as large as the cuartel barracks. The contours and heavy broken lines show the many folds of ground that form still smaller compartments within the larger one.

A considerably larger terrain compartment appears in

Figure 9, fold-out opposite page 14 which is a part of Geological Survey, Georgia—Alabama (Columbus Quadrangle), consisting of the Fort Benning reservation south of the First Division and Cusseta Roads. Here, two ridges running generally southwest and northwest—one from Fort Benning to Harmony Church, and the other from Jamestown Cemetery to Cusseta—are connected by a third somewhat narrower ridge extending from Harmony Church to Cusseta. The whole forms a U-shaped crest, inclosing a low area, swampy in places, cut by numerous streams, and traversed by inferior roads and trails. A good motor road runs along the crest from Fort Benning to Cusseta.

Now, entirely aside from the fact of the proximity of the Chattahoochee River on the southwest of this terrain compartment, it would be a very rash commander who would march a command of any size into the low ground within the compartment until he had first secured at least the side ridges. Let us suppose a commander did find himself forced to attack north from the line of the Lumpkin Road against an enemy holding the main ridges of the compartment. The enemy has the advantage in observation, fields of fire, obstacles, cover, and concealment. He has his adversary in a low bowl, all parts of which are within artillery range of the U-shaped ridge line. On the whole the terrain within the compartment is good ground to avoid getting into at all. But assuming that an advance must be made from the line of the Lumpkin Road, it is easily seen from a brief study of Figure 9, that all the approaches to the ridges that form the main outline of the terrain compartment, lie along the branch ridges—running generally to the south and west from the main ridges, or up the valleys between them.

Moreover, assuming the general line of the enemy positions to extend from Harmony Church to Cusseta, it is very apparent that both the ridge: Fort Benning—Harmony Church, and the ridge: Jamestown Cemetery—Cusseta, must first be secured before an advance to the northeast

can be made. This is simply a matter of common sense protection. Conversely, the seizure of these side ridges is a grave threat to the enemy; for these ridges form the

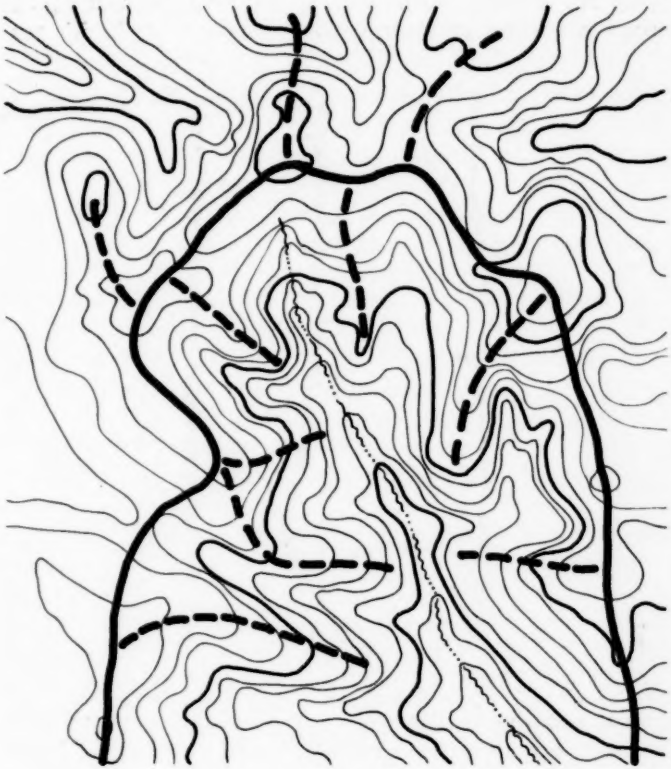

FIGURE 8

main routes of ingress and contain excellent artillery positions.

Often on less irregular terrain than that we have just

considered, where long narrow terrain compartments lead in the general direction of an attack, such corridors form the most advantageous channels of approach. (See Figure 10. The heavy vertical lines represent ridge lines separating the terrain corridors.) It may well be desirable for the commander of the attacking troops to make his main

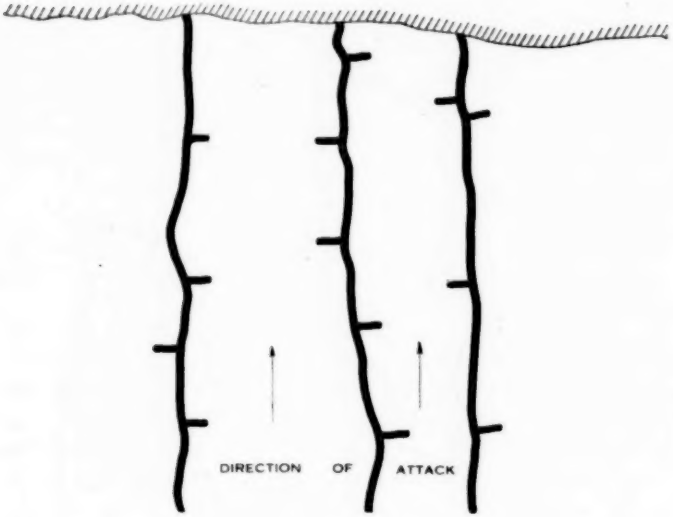

FIGURE 10.

effort up one corridor and his holding attack along an adjacent corridor or corridors. Troops advancing within a corridor are as we have seen, defiladed from direct hostile fire outside the corridor, especially from the direct fire of flat-trajectory weapons (machine guns, rifles, automatic rifles, 37-mm guns, and anti-tank guns). Activity within a corridor is also defiladed from observation from points outside the corridor, to a large extent.

Thus the chief problem of an attack along a terrain corridor is the reduction of the enemy fires from points inside the corridor. And here, again, the attacker cannot sweep

up the corridor with impunity without gaining a strong foothold on the high ground on one side or the other, if not on both sides. And in capturing such positions, use should be made of the lesser compartments in the long ridges forming the corridor sides.

The illustrative situation that follows in brief form is based on a French problem illustrating the use of terrain compartments in the attack. (See Figure 11, fold-out at the end of this chapter).

The Blues, advancing from the south, gained contact with the Reds on 8 May. On that day and the next, the Blues drove back numerous small advance detachments of the enemy; and by 10 May Blue leading elements had reached the line shown extending generally across the bottom of the map. On this day the Blue commander decided to stop all piecemeal efforts, and launch a general attack on the morning of 11 May to carry the hostile defensive positions, which are shown in Red.

The 1st Division Commander notes that the zone of action of his division* includes generally two terrain compartments. The visible horizon of the left compartment is bounded by hills *A, B, C, D, E, F, G,* and *H;* and that of the right, by hills *M, G, F,* Ridge *I,* hills *K,* and *L.*

Conforming to Corps orders, the division commander plans to utilize these compartments to the fullest in the execution of his attack. Therefore, he divides his attack into two general phases.

PHASE I.—Capture of Line S.—At H hour, the 1st Infantry, with one battalion of tanks attached, acting in conjunction with troops of the 2d Division on the left, will

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*The French division contains three infantry regiments —no brigades.

carry in succession hills *A*, *B*, and *C*. It will be covered on the east by the 2d Infantry, with one battalion of tanks attached, which will first seize hill *G*, then hills *F* and *E*.

PHASE II.—Capture of Line V.—This attack will be made by the 2d Infantry, in order to capture hills *L* and *K*, in conjunction with troops of the 5th Division on the right, and will begin at H′ hour, this hour to be fixed by mutual agreement between the respective commanding officers of the 2d Infantry and the regiment on the right.

In turn, the commanding officer of the 2d Infantry plans his attack in three phases.

PHASE I.—Capture of Line S.—The 1st Battalion, supported by two companies of tanks disposed in depth, will attack west of the ridge *MGF*, in order to cover the attack of the 1st Infantry, carrying in the first bound the nose: line *T*, and in the second, hills *F* and *E*. Then the 1st Battalion is to establish, on the ridge *FG*, a solid base of fire facing east, in order to support the later attack of the 2d Battalion on hills *L* and *K*. During this phase the 2d Battalion will assist the 1st Battalion by fire only.

PHASE II.—Capture of Line U.—The 2d Battalion will attack at H′ hour along the axis: hill *L*—hill *K*, supported by the base of fire established by the 1st Battalion, and in close conjunction with the unit on the right. It will capture line *U* without tank support.

PHASE III.—Capture of Line V.—At H″ hour (to be designated by the regimental commander), the 2d Battalion will renew the attack, capturing line *V*, supported not only by the 1st Battalion base of fire but by tanks which have rallied at the point indicated. The tanks will debouch from the low ground between hills *F* and *G*, and move eastward along ridge *I*. They will take in flank

and rear the defensive positions south and west of hill *K* during the development of the frontal attack.

Upon capture of lines *S* and *V* the 1st Division will have gained its objective. If more distant objectives had been assigned, the attack would be continued by similar methods. It may appear to be slow and prudent but it is, doubtless, less murderous than attempting to break strong defensive positions by frontal attack.

This brief outline gives us a clear idea of the zig-zag method of utilizing terrain compartments now taught by the French. Here, the terrain compartments happened to run diagonally to the direction of attack, instead of parallel or crosswise. We see, however, the use made of the main ridge that divides the two large compartments. In brief, the attack first forges forward on one part of a zone, and then, fires from the captured high ground are used to support the effort in the other part of a zone. This method is followed whether corps are involved, or regiments or smaller units. The French deem it necessary that the terrain wall between two compartments lie within the zone of attack of a single unit. To run the boundary between attacking units along the top of the high ground between compartments makes for weakness, they believe. It divides responsibility for what is essentially a single tactical job. And it throws a weak part of the attack—the juncture between two units—against a strong element of the defense.

References to suporting fires of artillery and infantry weapons, other than tanks, have been purposely omitted from this illustrative situation.

In conclusion, let us return to the elementary situation of the opposite ridges (Figure 1). Our first conclusion

was that ridges are seldom found which are simply smooth rounded slopes without irregularities. We then continued to examine terrain compartments of various kinds and sizes and finally, at some length, looked into the tactical application of terrain compartments. From what we found, we may well have concluded before this that the only weaknesses of the opposite ridge lie in its irregularities (its noses, gullies, saddles, woods, etc.). In modern warfare, the utilization of these irregularities, rather than a frontal Old Guard assault up the defended slopes, constitutes the key to the solution. And terrain compartmenting helps us to see this true tactical aspect of terrain.

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CHAPTER II

Military English

TOO MANY WORDS

It was once said of a famous author that he was intoxicated with the exuberance of his own verbosity. A good deal of military writing may well remind us of this saying, for it frequently contains supernumerary words, and long-winded phrases.

There is nothing about duty in the service of one's country that militates against writing concise, clear English. In fact, there is every reason for using just that kind of writing and no other kind. If war is the most uncertain of sciences we reduce this uncertainty in no way by using too many words.

Here are a number of examples of the kind of writing too often found both in war and in peace. They are taken from actual orders and instructional matter. Few of them are actually incorrect. Paired with each example is a shorter way of saying the same thing. The shorter way conveys the same meaning nine times, if not ten times, out of ten:

The following members of the command are excused from attending parade: . . . . .
These men are excused from parade: . . . . .

All the members of the brigade staff are in possession of the following information: . . . . .
The brigade staff knows that: . . . . .

The fire of the enemy's artillery upon the position of the 2d Battalion suddenly increased in density.
Enemy shellfire on the 2d Battalion area suddenly increased.

The purpose of this problem is to provide the student with instruction.
This problem is given to instruct the student.

The total amount of ammunition which the trains had with them amounted to 100,000 rounds.
The trains carried (were carrying) 100,000 rounds of ammunition.

. . . . . in the preparation of a problem of supply
. . . . . *in preparing a supply problem* . . . .

The potable water of the Bentley Springs will be availed of by the troops for drinking.
The troops will use the Bentley Springs water for drinking.

The buildings of the city afford very ample shelter which is ready to be availed of.
Ample shelter is available in the city's buildings.

All the different personnel is trained to be able to act both as scouts and observers.
The men are all trained both as scouts and observers.

. . . . . each of the various individuals comprising the squad.
. . . . . *each member of the squad.*

It is not considered necessary in this case that a formal march table be prepared.
A formal march table is unnecessary in this situation.

There seems to be no logical reason not to expect that it may also be of value to the defense.
It may also be of value in the defense.

There had been intermittent rifle fire all along the whole extent of the front of the 3d Battalion.
There had been intermittent rifle fire along the whole 3d Battalion front.

Under these conditions control was a much simpler problem.
Under these conditions control was much simpler.

. . . . . would be able to bring flanking fire on .
. . . . . *could place flanking fire on* . . . . .

. . . . . made a reconnaissance of the area assigned to the 1st Infantry.
. . . . . *reconnoitered the 1st Infantry area.*

Information was received by the Blues from a runner.
The Blues learned from a runner . . . . .

. . . . . a little checking up prior to the departure of the patrol.
. . . . . *a check-up before the patrol left.*

. . . . . received orders directing him to . . . .
. . . . . *got orders to* . . . . .

. . . . . will be responsible for the protection of the south flank of the bivouac area . . . . .
. . . . . *will protect the bivouac area's south flank*

It is apparent that it is necessary that the commander of the section be present.
. . . . . *that the section commander must be present.*

This is largely dependent upon . . . . .
This depends largely upon . . . . .

. . . . . a report stating that . . . . . .
. . . . . *a report that* . . . . . .

Few of these wordy phrases and sentences are actually ungrammatical. Their correctness in this respect, however, is no excuse for using them in military writing in which the utmost conciseness consistent with exact meaning is the ideal. The free use of unnecessary words makes for muddiness of thought and understanding.

When an army officer one day grows full of years, experience, and knowledge, and sits down to write a book, he may be pardoned if his words flow freely and his verbosity becomes exuberant. Nevertheless, verbosity and good writing are never synonymous.

TOO FEW WORDS

It is also possible to carry conciseness to a degree that makes military English a half-intelligible jargon. The most common offense, perhaps, is the omission of the articles "a", "an", and "the", in an attempt to obtain the so-called telegraphic style.

The proper place for the telegraphic style is in telegrams, or—in military writing—field messages. And even there, the utmost caution should be used to see that leaving out "a", "an", or "the", in no way alters the intended meaning. With care, the telegraphic style can be made unmistakeably clear. But the time required to do so is ordinarily far longer than what is spent in writing the same words in ordinary English.

In writing field orders, the same thing holds true. There is no necessity, of course, for making a field order a piece of classic English. At the same time, however, there should be no more chance for error here than in a message. And the officer who forms the habit of dropping out the small words can all too easily change or confuse his meaning, for sometimes a small word—even a "the"—is vitally important.

"With mission of securing railroad facilities in Gettysburg" may be clear enough to most of us; but the commander who thus drops out his articles must beware of the literal mind. The literal mind might secure one of two railroads and be content. Likewise, if ordered to "occupy high ground east of Gettysburg", the literal mind might occupy two hills, and let three others go.

Again, "Field trains will assemble in bivouac area" may be perfectly understood by a battalion commander who already knows that a bivouac area has been established. If, unfortunately, he is unaware, or has forgotten that a bivouac area has been established, or if he is confused by the new experience of commanding troops in war, he may give orders of his own for establishing a bivouac. But if the order reads "will assemble in *the* bivouac area, the small additional word helps him to remember or realize that "*the* field train bivouac" is usually a regimental function.

A third example: "All units to be prepared for attack." The omission of *the* makes us doubtful here whether we are to defend against a hostile attack, or get ready for an attack of our own.

There is still another excellent reason for avoiding a too concise manner of writing military English. We are so used to seeing the little articles in written speech that when they are not there, we require considerably longer to understand what we read. We are not all clerks in telegraph offices. We have seen that the studied omission of these words causes delay to the writer: it causes delay to the reader also.

Let us examine two sentences here to illustrate this point. This is the first:

"Colonel '1st Infantry' announced order to battalion commanders and assembled staff officers".

On reading this sentence, we may grasp the meaning at once. "Announced order" is probably clarified by something that has come before. And we may accept "assembled" as a participle rather than as a verb. But it is not at all unlikely that some readers would understand that Colonel "1st Infantry", after giving an order to the battalion commanders, then assembled his staff officers.

As a second illustration, let us read the following sentence, noticing as we do, how often the omission of the articles causes a halt to understanding.

"As head of support reached west end of bridge over Conewago, Lieutenant Colonel '1st Battalion', who was riding at head of support with staff, sergeant major, and mounted orderly, received message that hostile force was on high ground to front."

In most military writing there is no excuse at all for foreshortening English in the attempt to be concise. If accuracy and clarity are prized—and certainly they are—let us respect the connecting files of our language. We are too used to them now. They are too much a part of English after twelve centuries or more of usage, to be readily discarded.

CHAPTER III

Small Problems—Infantry

PROBLEM NO. 1

A Machine-gun Platoon in Attack

The 2d Battalion had made splendid progress during the morning; like the units on its flanks, it had driven back the enemy steadily. But not long after noon, as the forward elements of the battalion reached the crest of Hill *A*, (See Figure 12, fold-out opposite page 42) they came under heavy fire from Hills *B* and *C*, and Ridge *D*. and there on Hill *A*, the battalion stuck for two hours, unable to advance another yard.

Hostile artillery and machine guns, both, were doing their best by 1:15 PM to make Hill *A* untenable. The enemy machine guns seemed also to be "paying particular attention to" the spur running from Hill *A* through (5), (6), and (7). By this time, too, the 2d Battalion had lost so many men, and was so badly disorganized, that the regimental commander decided to order a passage of lines at 3:00 PM by the 1st Battalion.

The 1st Battalion was in reserve in the assembly area south of Division Road. The battalion commander assembled his company commanders and issued his order. At 2:00 PM Captain Company D, in turn, assembled his platoon leaders with their corporal agents, at point (2) on Division Road. After leading them forward a little until they could see the terrain to the front over the crest of Ridge *E*, Captain Company D issued the order that follows:

"That hill straight to the front and just to the right of the woods is Hill *A*. Over to the right of Hill *A* you

see Ridge *D*. Several hundred yards directly north of Hill *A* is Hill *C*. You can't see Hill *C* because it is masked by Hill *A*. Hill *B* is over the woods there to our left front, and to the left of Hill *A*. And Hill *F* is that distant hill still farther to the left. The enemy holds Ridge *D* and Hills *B*, *C*, and *F*.

"The 2d Battalion is stopped on Hill *A*. The troops on the left of the 2d Battalion are roughly abreast of it in those woods (Woods W).

"Our battalion will pass through the 2d Battalion at 3:00 PM, and capture Ridge *D* over there to the right, and the two hills, *B* and *C*, now held by the enemy."

The captain then pointed out the battalion boundaries as they are shown on the map. "The boundary between the assault companies," he concluded, "runs through the railroad crossing immediately in front of us, and through the crest of Hill *A*. If we look at Hill *A* from where we are, we are looking right down the boundary.

"Company B is the left assault company. The 1st Platoon will support the attack of Company B from positions north of the railroad and within the zone of that company.

"The 2d Platoon * * *

"The 3d Platoon * * *

"The ammunition dump will be in the draw about 300 yards down the west edge of the woods just behind us.

"The aid station * * *

"Our CP will be in that draw in the woods 300 yards to our left front (3).

"It is now 2:05. Are there any questions?"

Lieutenant 1st Platoon Company D asked the captain if he knew where Captain Company B was. The captain told him that Captain Company B had gone forward to reconnoiter his zone.

Under cover in the woods just to the rear, where Lieutenant 1st Platoon had left them, are the three platoon messengers. The mounted orderly, with the platoon leader's horse, is in the woods near the messengers.

REQUIREMENT

The actions and orders of Lieutenant 1st Platoon from the time he receives the order from Captain Company D until he is ready to proceed on reconnaissance, giving the place of issue of all orders, to whom they are issued, and the contents.

A SOLUTION

Lieutenant 1st Platoon signals back to the messengers to join him, and to his orderly to bring up his horse. While they are coming up he looks over the ground to the front again. As soon as they arrive he orders one of them: "White, go back to the platoon and guide it up to the point in the woods just the other side of that road junction (2). Double-time all the way back and tell the platoon sergeant to move the platoon up just as fast as he can."

Then he turns to the corporal agent and the other two messengers: "Corporal, you heard the captain's order and you know where the enemy is. I want you to take these two men and go down the Division Road toward the water tank there, and pick out the best place for the platoon to cross the road down into that draw to our left front (3). Then show the sergeant the route and tell him to take the platoon there. Tell the section leaders to join me on the reverse slope down between the edge of the woods and that road bend (1), as soon as the platoon gets into the draw. You and the messengers also report to me there."

DISCUSSION

By the time Lieutenant 1st Platoon has received his orders it is 2:05 PM. The attack is to begin at 3:00. Only 55 minutes to get his guns in position and open fire! He's got to move fast. His platoon is still in the assembly area, which is 20 minutes march to the rear. He has no time to reconnoiter a defiladed route to the front for the platoon. In fact, he has only time enough for a quick reconnaissance to pick positions for the sections. Therefore, he first sends a messenger back at the double-time to have the platoon brought up, and then has the corporal agent reconnoiter for a route across the exposed ground along the Division Road.

As soon as he finishes his reconnaissance, Lieutenant 1st Platoon will need to have his section leaders as near the probable gun positions as practicable so that he can give them their orders. Accordingly he sends orders to the section leaders to assemble at a convenient place. He could, instead, have the section leaders leave their sections to come directly forward. It was better, however, for them to stay with their units during the march forward, owing to possible casualties. Besides, he is not likely to finish his reconnaissance before the platoon comes up; hence no time would be gained by having the section leaders come directly forward. The rendezvous (1) is fairly close to any probable point of employment of the sections, and as it can be clearly seen by the corporal agent to whom he gives the order, there is no chance of misunderstanding on his part.

CONTINUATION OF THE PROBLEM

Lieutenant 1st Platoon then mounted and galloped across the open space to his left front, entered the woods and went forward to see what the situation was. As he hastened on, he passed a number of walking wounded from the 2d Battalion, making their way to the rear, among them First Sergeant Company F, whom he met near (8).

"It's a mess up ahead, sir," the sergeant told him. "There's a few men dug in up toward the top of Hill *A*, that are holding on all right; and about half-way up this side of the hill just to the left of the road (4), there's one machine-gun still firing. That's it firing now. It's the only one I've heard for half an hour."

Lieutenant 1st Platoon pushed his horse on through the woods until he reached the stream bed just north of (8), and then moved downstream to the edge of the woods. A few 2d Battalion riflemen and auto-riflemen were up on the nose firing steadily, and he could see men of the flank units off to the left across the valley in Woods *W*.

He turned back into the woods, rode up the slope to (6) and then to the east side near the road bend, where he dismounted. He visited the machine gun at (4).

He found out what the gun at (4) could fire at, tested for safety, told the corporal in charge that the 1st Platoon guns would open up at 3:00 for the new attack, and arranged for the gunner to conserve his fire as much as possible until he heard the attack begin.

Then, Lieutenant 1st Platoon went back into the woods, mounted up and rode south, following the road to where it left the woods, and then the edge of the woods around toward (1), observing the forward slopes of Ridge *E* as he went. About half-way between (8) and (1) he was lucky enough to run into Captain Company B.

"What the hell is the situation up front?" asked the captain. "It'll be time to jump off by the time we get up there. I won't have much time to look around."

Lieutenant 1st Platoon rapidly told him what he had seen. Captain Company B had a map, and indicating the ground on it, showed the lieutenant what he planned to do.

"I'm going to have one platoon attack Hill *B* through Woods *X*, with its right guiding along the northeast edge of the woods. My left platoon will attack toward Hill *B* from well out on the west end of that spur (5), (6), (7). My reserve platoon will be in that gully in the woods just ahead of us."

"Woods *X* are almost shot away," replied Lieutenant 1st Platoon. "Just like that point of woods over there toward Hill A" (just east of 8). "My gunners can see right through Woods *X*, which will help a lot in supporting your attack."

"O. K.," said the captain. "You'd better give me all the support you can by fire on Hill *B*. That's the only place I want it initially."

Lieutenant 1st Platoon then mounted again and rode toward (1). He dismounted in the woods just west of (1). His section leaders, the corporal agent, and the three messengers had reached that point. He took them all with him up toward the forward edge of the crest of Ridge *E*.

REQUIREMENT

1. Where is he going to put his guns, and what type of position (sight defilade, position defilade, or simple concealed position) will he use for them?
2. Where will he put the carts?
3. Where will he have his command post?
4. If Lieutenant 1st Platoon plans to use 8 boxes of ammunition per gun during the initial stages of the attack, what will be done to replace it?

A SOLUTION

1. In sight defilade on the north slope of Ridge *E* just below the road bend near (1).
2. In the draw at (3).
3. In the same place.
4. The transport corporal will consolidate the loads of the ammunition carts, and then take the three empty carts back to the combat train at the battalion ammunition DP southeast of the Water Tank, where the carts will be refilled. The corporal will then bring them back.

DISCUSSION

As soon as Lieutenant 1st Platoon has taken steps to get his platoon moving forward from the assembly area, and has arranged to meet his section leaders, corporal agent, and messengers, he must lose no time in beginning his reconnaissance. He has a lot of ground to cover, and as his mount is close by, he saves time by using it. If he had more time, and had less ground to cover, it would be well for him to have the corporal agent and the two remaining messengers along on reconnaissance. The more the corporal agent knows about the situation, and the mission of the platoon, the more efficient he will be later in performing his regular agent duties with the supported rifle company. Again, if the platoon leader should become a casualty while on reconnaissance, the corporal agent would be able to take back all available information to the platoon sergeant so that the platoon could carry on with its supporting mission.

The messengers, too, would be of value on the reconnaissance. One of them could follow at a distance so that all members of the reconnoitering group would not become casualties from a single artillery shell.

But neither the corporal agent nor the messengers are mounted, and in addition, Lieutenant 1st Platoon has given them useful work to do in reconnoitering a route for the platoon to follow in moving forward, thus saving

the platoon sergeant delay. Accordingly, Lieutenant 1st Platoon makes his reconnaissance on horse, accompanied only by his orderly.

Before he decides where he is going to put his guns, he must learn the plan of attack of Company B, the unit he is supporting, and get all the information of value that he can, from units already in position. As he rides forward through the woods he does not find Captain Company B. Knowledge of the terrain to the front is the most important thing, however; so he pushes on forward hastily and obtains the information he wants.

On visiting the 2d Battalion machine gun at (4), he finds that the terrain is exposed and decides that if he puts his own guns there, they are not likely to last very long in the face of the heavy enemy artillery and machine-gun fire. Besides, if he puts his guns in there, they will have to hold their fire until Company B gets into the low ground in Woods *X*. But Captain Company B may be planning to make his main effort on the left of his zone, in which case, the position at (4) may be the best available. On the other hand, the position is so far forward that it is unlikely that his platoon can get into position there in time for the beginning of the attack. But as the position may be used, Lieutenant 1st Platoon tests for safety. And before he leaves, he arranges for the fire of the gun now there to join in the support of Company B's attack.

Coming back to the rendezvous, Lieutenant 1st Platoon keeps an eye out for Captain Company B, who, making his reconnaissance on foot, is probably still on his way forward. He finds him, gives him what information he has, and learns his plan of attack. Then he goes on to the northern slope of Ridge *E*, which is the last place he reconnoiters.

In deciding to place his guns there, he weighs all the advantages and disadvantages of the possible positions he has seen while on reconnaissance. He considers the different positions as follows:

Concealed position in brush and woods near (6).—This position is on the front line and is exposed. It does have

the advantage of excellent fire effect and close contact with the supported units. Moreover, the guns can be displaced forward promptly, and there would be little interference by the assault elements because the position is in a gap. Except for being so exposed, this is the best position of all.

Sight defilade near (*7*).—This position is generally similar to (6) but has the additional disadvantages that fire from it is likely to be masked by assault troops as they jump off, and that it is exposed to hostile fire from Hill *F*.

Position defilade near (*5*).—This position is in an area already under heavy enemy fire. Assault troops are likely to interfere with fire from this point, also. On the other hand, it has good concealment by position defilade, good fire effect, and close contact with supported troops.

Position near (*4*).—This position has been discussed above.

Sight defilade on the forward slope near (*8*).—This is a good position. It is out of the greater part of the hostile fire and affords good fire effect. It does not afford close contact with the spported units and does not have very good cover.

Position near (*1*).—This is the best place. It has excellent fire effect. The guns will probably suffer less here from enemy fire than they would at any of the other positions. There is an excellent route to the position. It does not, however, have as close contact with the supported troops as most of the other positions, nor can the platoon be displaced forward as quickly.

CONTINUATION OF THE PROBLEM

Having selected positions for the guns with the section leaders present, Lieutenant 1st Platoon ordered them to get the guns up. He sent the corporal agent to join Captain Company B. He directed the man with the range-finder to read the ranges to points along the forward crest of Hill *B*, tested for safety, and gave the fire order as soon as the guns were in position. At 3:00 PM the platoon was ready to open fire.

Both platoons of Company B advanced slowly up the slopes of Hill *B* against a terrific enemy fire. They almost converged as they reached the northern edge of Woods *X* and fought their way, yard by yard, toward the line of the road. The 1st Platoon Company D stopped firing, for a few men had moved forward out of the woods and had reached the safety limit. But immediately the hostile fire increased, and Company B could make no further progress at all. The platoons were pinned to the ground and their casualties were rapidly increasing.

The machine-gun platoon has had three casualties.

REQUIREMENT

What decision does Lieutenant 1st Platoon make at this time?

A SOLUTION

Lieutenant 1st Platoon decides to resume firing immediately, using the rapid rate, in order to beat down the fire of the enemy and allow the attack to resume its advance.

DISCUSSION

Although a few of the troops are now just beyond the safety limit, the situation is so critical that the safety rules must be shaded. There is a slight chance that the lowest shots of the 100% cones will drop close to the front line, but the risk must be taken. The resumed concentration of the machine-gun fire on the enemy position will keep down the hostile fire, which is now causing many casualties. If necessary, the fire can be raised so that the lower half of the cone only can be directed upon the enemy position. Careful observation of the fire is now necessary so that Lieutenant 1st Platoon can tell when the fire must cease.

CONTINUATION OF THE PROBLEM

The attack upon Hill *B* is succeeding. The advance elements of Company B can be seen crossing the road on the south slope. The 1st Platoon Company D has stopped firing because it is now unsafe. All four guns are still in position prepared to resume firing. The situation on Ridge *D* is unknown. Hill *F* is still in enemy hands. The carts are now in the draw near (3).

Lieutenant 1st Platoon considers the situation and decides to displace forward.

REQUIREMENT

State the orders as actually issued by Lieutenant 1st Platoon for the displacement.

A SOLUTION

To the platoon sergeant and section leaders from a point near the platoon:

"We will move forward to the south slope of that hill (*B*) upon my signal. I am going ahead on reconnaissance.

"2d (left) Section: *Out of action; By hand, follow me.* Move under cover of those trees and the lower ground to the left front. Cross the next spur rapidly. Follow me through those woods (Woods *X*).

"1st (right) Section: Remain in position to cover the advance and to engage possible counterattacks.

"Platoon sergeant, take charge of the 1st Section. Move it forward when I signal you from near that road on Hill *B*.

"If it's all right to use carts, I will signal: *Double-time*; if not, I will wave a hat from side to side.

"Any questions? Move out!"

DISCUSSION

In every displacement the following things must be decided by the platoon leader:

The general area to which the displacement is to be made.

The method; i.e., whether by section or by platoon; and if by section, which section is to displace first.

The route.

The time of displacement, to include arrangements for bringing up the rear section.

Whether transport is to be used.

Lieutenant 1st Platoon decided to displace forward by section because it is a good rule to leave some guns in position to protect the supported unit in case of a counterattack. Having decided to displace by section, he must then decide which section will go forward first. In this case, the left section was selected because the terrain on the left of the zone affords a covered route forward.

In coming to his decision Lieutenant 1st Platoon had to weigh two other factors also: the advantages of the present position of his sections in the event of a counterattack, and the condition of the sections with particular regard to casualties. As to the latter factor, his casual-

ties have been few, and will not hinder the platoon's moving forward in good order. He takes care of the first factor, as we have seen, by displacing forward by sections.

The next point to be decided is whether the leading section shall go forward by hand or on transportation, and by what route. In this case the decision was to advance the leading section by hand in spite of the fact that the distance is about 700 yards, because of the exposed nature of a portion of the route. In making such a decision the following factors are considered:

The length of the required bound.

The amount of cover available.

The tactical situation.

The condition of the men.

In general, for all movements of less than 400 yards; and for those of greater length along routes partly or wholly exposed to hostile direct fire, it is best to advance the leading section, if not both, by hand.

Lieutenant 1st Platoon issues his orders a short time before the actual movement is to commence in order not to lose time when the moment for displacement arrives. At the proper time the execution begins upon signal.

CONTINUATION OF THE PROBLEM

As soon as he had given his order, Lieutenant 1st Platoon and his orderly rode forward toward Hill *B*, keeping to the low ground and woods. As they came out of the northern edge of Woods *X*, Lieutenant 1st Platoon saw Captain Company B, the corporal agent, and messengers, on the road just ahead. Dismounting in order to leave the horses under cover, Lieutenant 1st Platoon went over to Captain Company B and told him that one section of machine guns would be up in about five minutes.

"Fine," replied the captain. "I'll tell you what the situation is, up here, as far as I know it.

"My assault platoons are held up here. The right part of my line is dug in along the saddle between here and Hill *A*. They are pinned down by fire from Hill *C*. The remainder of my assault platoons are there near the crest of Hill *B*. The crest and the western slope are swept by machine-gun fire from the top of Hill *F* at (9). The troops to our left have not been able to take Hill *F*. You see them over there still trying to push forward from Woods *W*.

"The enemy front line on Hill *F* is located about halfway down the south slope. There are two machine guns on the slope, straight down from the crest near the front line (10).

"I don't know what the situation is on Ridge *D*. The right assault company probably has it by now. We have received no fire from that direction.

"I just received orders to attack Hill *C* from the west with my reserve platoon just as soon as I can. I'll certainly need your help. What can you do for me?"

REQUIREMENT

The initial fire mission assigned to the leading section when it arrives.

A SOLUTION

Lieutenant 1st Platoon orders the leading section to engage the enemy resistance on Hill *F*. Not over four boxes per gun are to be used unless ordered later.

DISCUSSION

In this situation, the most effective way to help Captain Company B carry out the maneuver desired is to assist the unit on the left to capture Hill *F*, thus allowing Company B to move around the western slope of Hill *B* and attack Hill *C* from the west.

CONCLUSION

The attack on Hill *C* was successful. By dark, the battalion front line ran approximately east and west through Hill *C*, and the unit on the left of the 1st Battalion had taken Hill *F*. After the continued repulses of the day, the enemy withdrew during the night and began a general retreat. Later, the regiment received commendation in orders for its steadfast work in this battle, with especial reference to the two attacks made by the 1st Battalion.

PROBLEM NO. 2

A Howitzer Platoon in the Attack

An infantry battalion with a howitzer platoon attached (an interior battalion) has been attacking south within the zone of action shown on the map. (See Figure 13, fold-out opposite page 50.) The battalion's advance elements are now stopped as shown, on the spur running west from Hill *A*, as a result of hostile rifle and machine-gun fire from Hill *B* and the saddle to the east. Hostile artillery also is pounding away hard at the front-line elements of the battalion. Nevertheless, the battalion is still in good shape. It has only just now halted its advance; and the battalion commander, as soon as his troops can get their wind and as soon as he can make a few changes in his dispositions, plans to resume the attack.

The fire holding up the right (west) assault company comes principally from machine guns near (2). These guns are enfilading the draw running to the northwest from that point. One gun has been definitely located at (2).

The fire that stopped the left (east) assault company is rifle and machine-gun fire coming from a combat group in the woods (1), and fire from machine guns on Hill *B*. Two of these guns have now been definitely located at (3).

In order to avoid as much of the hostile fire now reaching him as he can, and especially any possible additional fire from Hill *C*, Lieutenant Colonel "1st Battalion" is going to push his main attack along the left of his zone where the woods and brush on the southwest slope of Hill *A* afford a covered approach. He has already, in fact, directed the howitzer platoon to support such an attack. He wants the howitzer weapons sited to cover the whole zone as far as possible, but particularly to support the left assault company.

After getting these general instructions, Lieutenant "Howitzer Platoon", who understands the situation, reconnoiters for positions for his weapons. He notes positions (4), (5), and (6) as fulfilling the requirements for 37-mm gun positions; and he notes other locations for his infantry mortar, and the ammunition squad. As he returns to the battalion command post, he decides what he is going to recommend.

REQUIREMENT

The recommendations of Lieutenant "Howitzer Platoon" to include:

Positions for the 37-mm gun, the infantry mortar, and the ammunition squad; and targets in the order of their importance, for each of the above weapons.

(NOTES.—Assume that positions selected involve no conflict with areas desired by machine-gun company.

The mortar has a usable range of 1800 yards.)

A SOLUTION

Positions for—

37-mm gun: In sight defilade at (5).

Mortar: In the draw about 150 yards northeast of (5).

Ammunition squad: In the draw just northwest of (5).

Targets for—

37-mm gun: Machine guns at (3) and (2), in that order of importance.

Mortar: Areas at (1), (3), and (2), in that order of importance.

DISCUSSION

There are two opposing factors that must usually be considered in siting howitzer platoon weapons. The different characteristics of the 37-mm gun and the infantry mortar may require that they be placed some distance apart; and, at the same time, ease of control requires that they be placed close together. As neither factor can be neglected, the best compromise that the terrain offers must be accepted.

It is easier, ordinarily, to find suitable positions for the mortar. Hence the 37-mm gun is usually sited first. In the problem, Lieutenant "Howitzer Platoon" first noted the available positions from which he could accomplish his mission. Then, he weighed each position considering in turn the elements of safety for gun and crew, ammunition supply, ease of displacing forward, and closeness of contact with supporting troops; and then selected the gun position best satisfying these considerations. And finally, he placed the mortar at the best available spot close enough to satisfy the necessity for controlling the two weapons by a single commander and supplying them from a single ammunition squad.

Lieutenant "Howitzer Platoon" avoided all positions near the front line. In such positions there was too much risk that the weapons would be speedily put out of action. The position at (6) was suitable but did not allow close contact with the supported troops, quick displacement forward, or a good position for the mortar close by.

The main mission of the howitzer platoon is to reduce the effectiveness of the enemy's fire by combatting his machine guns. The 37-mm gun engages machine guns that have definitely been located. The mortar searches areas in which machine guns are known to be located, when their positions have not been determined with sufficient accuracy for the 37-mm gun to be effective against them. In addition the 37-mm gun fires on tanks, and the mortar on defiladed important areas or installations, which cannot be reached by the fire of other weapons.

In the problem, the targets at (1) and (3) could probably do the most harm to the attack of the left assault company. These, therefore, would be engaged first. And not until these two targets are disposed of should fire be shifted to other targets, provided, of course, that other targets still more important, such as attacking tanks, do not appear.

CONTINUATION OF THE PROBLEM

The attack upon Hill *B* was successful. Units on the left captured the southern edge of Hill *A*, but on the right the enemy still holds Hill *C*. Hostile machine guns on this hill stopped an attempt to continue the attack upon Hill *D*. One machine gun has been definitely located at (7); and other machine guns are firing from that area.

Although our artillery is firing upon Hill *D*, there is still some machine-gun fire directed upon our front line from that vicinity.

Lieutenant "Howitzer Platoon" is on Hill *B*. His platoon has just arrived at (1).

Neither the battalion commander nor any of his staff have yet arrived on Hill *B*.

REQUIREMENT

Targets selected by Lieutenant "Howitzer Platoon".

A SOLUTION

Lieutenant "Howitzer Platoon" decides to engage targets and areas on Hill *C*, at once, with both of his weapons.

DISCUSSION

The most damaging targets to the attack of the 1st Battalion were those on Hill *C*. Hill *D*, which is within our zone, was already being fired on by our artillery.

Hill *C*, it is true, was outside of the battalion. Moreover, there was some danger that friendly troops might run into the howitzer platoon fire. Nevertheless, the situation required that the machine guns on Hill *C*, which have taken our attack under flanking fire, be engaged at once, with every precaution taken, of course, for the safety of friendly troops.

CONTINUATION OF THE PROBLEM

The Howitzer Platoon is now engaging targets on Hill *C*. The mortar is in position in defilade near (1) and the 37-mm gun is firing from sight defilade about fifty yards south of (1). From its position the 37-mm gun can only fire at the hostile positions on the crests and upper slopes of Hill *C* and Hill *D*.

Suddenly a counterattack develops from near (8). This counterattack is accompanied by tanks moving from the vicinity of (9) toward Hill *B*.

REQUIREMENT

Target engaged by the 37-mm gun; position of the 37-mm gun to engage the target selected; and target engaged by the mortar.

A SOLUTION

The 37-mm gun switches immediately to the hostile tanks (9). The gun must be run forward from its position in sight defilade to a position from which the tanks can be engaged. The mortar fires on hostile counterattacking troops in the vicinity of (8).

DISCUSSION

Regardless of what targets howitzer weapons may be firing upon, when a counterattack comes, they must immediately switch their fire to the new targets—elements of the counterattack—that are now the greatest threats. The new targets chosen, however, should still be those most suitable for each howitzer platoon weapon. Thus, in the problem, the 37-mm gun immediately engaged the tanks as they appeared—these in preference to any other target both because they were the more dangerous of the two new targets and because they are suitable for the weapon. The mortar, on the other hand, did not engage the tanks; for mortar fire is ineffective against tanks. Instead, the mortar directed its fire against troops near (8), thus assisting to repel the counterattack in the most effective manner that the situation offered.

PROBLEM NO. 3

A Rifle Squad in Defense (Musketry Problem)

Company A has been occupying a defensive position for several days. The 3d Squad under Corporal C has

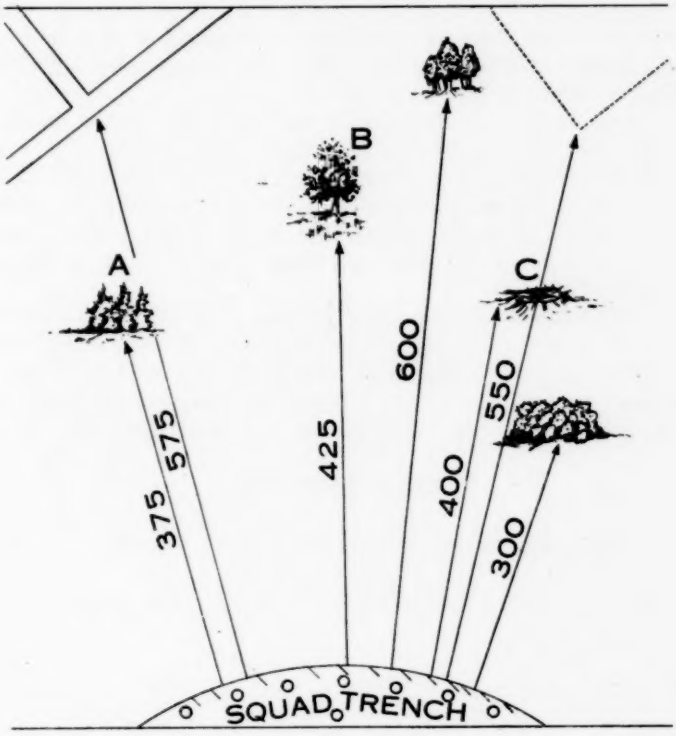

FIGURE 14

been given a sector to defend. Corporal C has prepared a range card covering his sector, and accurately measured the ranges to prominent terrain features and other objects within his sector. (Figure 14.)

The enemy appeared in force yesterday afternoon, and during the night drove in the outpost, which withdrew around the flanks of the position to a position in rear of the main line of resistance. Corporal C has orders to immediately engage with fire any enemy units appearing within his sector.

Shortly after dawn one of the sentinels posted in observation by the 3d Squad notified Corporal C:

"There are two or three enemy riflemen moving around near that clump of bushes out there (*A*). Several more are in the long grass near that tree. I saw them a few moments ago but I don't see them now." (Points to *B* on sketch.)

Corporal C readily picks up the first group of enemy at *A*, and detects some movements at *B*. He alerts his squad, and while they are moving into their firing positions, he sees two of the enemy, one dragging a machine-gun tripod, moving by crawling to a shell hole at *C*.

REQUIREMENT

Fire order issued by Corporal C to his squad.

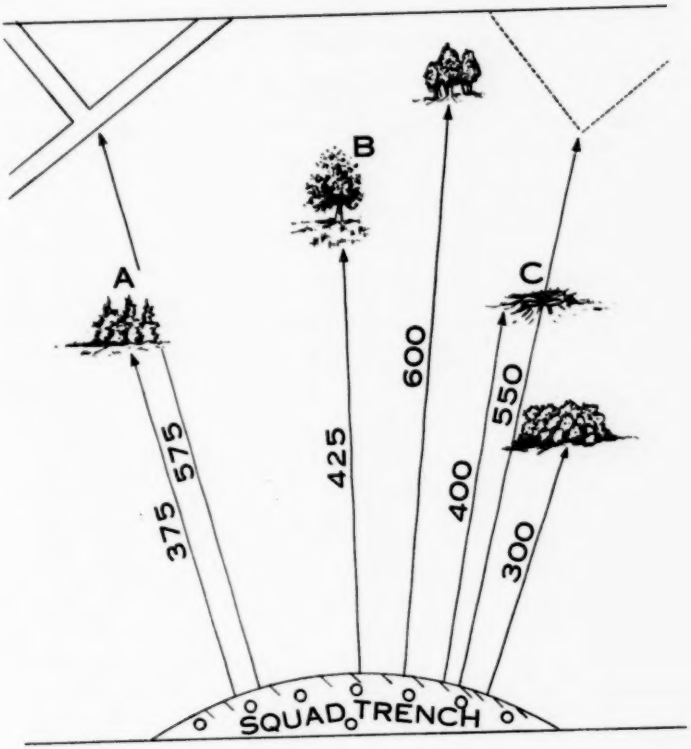

FIGURE 14

SOLUTION

Range 400.

To your right front, shell hole.

In rear of shell hole, machine gunners.

Jones (auto rifleman) and Johnson (assistant auto-rifleman), your target.

Fire at will.

Range 375.

To your left front, clump of bushes.

At base of clump, group of riflemen.

Larson, Wilson, and Murphy, your target.

Fire at will.

Range 425.

To your front, one tree.

At right of base of tree, group of riflemen.

Garland and Brown, your target.

Fire at will.

DISCUSSION

In this situation we find Corporal C faced with the necessity of engaging promptly with fire three hostile targets appearing almost simultaneously in his squad sector. He naturally desires to engage the most dangerous target with a large volume of fire with the least delay, and he therefore orders the automatic rifleman and the assistant automatic rifleman to fire at once on the hostile machine gunners in rear of the shell hole. This action quickly places a large volume of well-aimed fire on the gunners and renders their position untenable. To place the fire of the automatic rifleman alone on this target would be faulty, in that some stoppage in the action of

the automatic rifle might occur, or the automatic rifleman might become a casualty, leaving the target not covered by fire, and the automatic rifle inactive.

The group of riflemen to his left front constitutes a greater threat than the group barely visible at point *B*, and at a greater range. He orders the fire of three riflemen placed upon this target. It would be a mistake to engage this target with fewer rifles.

The group of riflemen at point *B* is barely visible, but their presence there cannot be ignored, and some fire must be brought upon their position. Corporal C rightly places the fire of the remaining riflemen in his squad upon this target.

In each instance he completes the fire order with "Fire at will", thereby insuring almost immediate fire.

He designates the several targets before assigning them to individuals in order that all members of the squad not otherwise engaged will have their attention focussed on the target, thus insuring coordination and teamwork within the squad in case it becomes necessary to shift or concentrate their fire later. To designate the individuals who will engage a particular target before announcing the range, and describing the target, is liable to result in lack of attention on the part of the other members of the squad. It is true that each part of the squad assigned a specific target pays little or no attention to that part of the fire order issued after their own part. However, the attention of all members of the squad is focussed on the most dangerous target, that of six members on the next most dangerous target, and that of three members on the final target.

Corporal C could have described all three targets to his squad, and then made his assignment of personnel to engage them; but the necessity for an almost immediate placement of fire on the hostile machine gunners precluded this.

In order to obtain fire superiority, every member of the squad or "fire-team" must be aware of what every other member of the squad is doing. This knowledge in-

sures flexibility of fire control and the maximum fire effect.

Analysis of the situation confronting Corporal C, his decision and fire order, brings out the importance of stressing, during the period of training in musketry, the following principles:

1. Oral description of targets is sometimes preferable to the use of tracers. All leaders should be proficient in this method of target designation. Battlefield targets are generally indistinct, and must be clearly indicated by the leader. Fire at half-guessed targets has little effect.

2. Distributed fire is the quickest and most effective method of insuring that all parts of the target are brought under fire.

3. The automatic rifle produces a great volume of fire and, hence, should be employed against the most dangerous targets. Every effort must be made to keep this weapon continuously in action.

4. Fire control is essential to teamwork and the effectiveness of collective fire.

CHAPTER IV

Fast Tanks

INTRODUCTION

There can be no question that a fast and reasonably dependable tank has been produced and that the armies of the world must learn how to use this weapon to the greatest advantage. The number of fast tanks now furnished to our army is so small as to limit seriously its possibilities of tactical experiment. We may hope, however, that the numbers will increase in the near future, and that what is now only reasonable theory in tactics may be tested and proved in practice. It is the purpose of this article to discuss a few of the factors influencing the employment of fast tanks.

THE APPROACH MARCH OF THE FAST TANK

With the advent of the fast tank, the problem of getting tanks to the battlefield is very much simplified, and the flexibility of the support that can be rendered by the mass of tanks held in GHQ reserve is greatly increased. Moves of considerable length can now be accomplished by tanks operating under their own power, and successive tanks concentrations can be effected with rapidity at widely separated points along an extensive front. Tank carriers are no longer required, and the time and equipment necessary for rail movements have been greatly reduced. Because of its increased mobility, a tank unit has more latitude in the location of its installations. Tank parks can now be established farther to the rear, thereby avoiding to a considerable degree the hostile long-range artillery

fire. This also avoids congestion in more forward areas. Furthermore, tanks are able to remain longer with safety in their parks. The approach march, for which slow tanks usually required one entire night and often two, can be accomplished in the early hours of a single morning. Speed in the approach march coupled with the absence of a characteristic noise insures greater secrecy of concentration, thus obtaining the important element of surprise, which noise and slow speed often denied to the old tank. Greater dependability and increased fuel capacity, moreover, reduce the amount of final adjustments and refueling that must be accomplished at the assault positions. The detrucking point has become a thing of the past.

And finally, where the slow tank usually required from several minutes to half an hour to move from its assault position to the line of departure, the fast tank can be depended upon to accomplish this in a considerably less time. This means that assault positions may be located farther in rear of the line of departure, with the resulting advantages of better cover, fewer casualties, and better facilities for the crews to make their final preparation for battle.

ACCOMPANYING TANKS

Once the fast tank has reached the battlefield, there are several possible methods of employing it. But regardless of what other uses it may be put to, the fast tank is certain to be demanded by the assault troops as an accompanying tank, to help them destroy the sources of hostile fire that immediately check their advance. It may be well here to quote the Infantry Field Manual's definition of the mission of accompanying tanks:

"The mission of accompanying tanks is to render close cooperative assistance to the advance of the assaulting waves of attacking troops. Such tanks normally consist of light tank platoons which are attached to infantry battalions. They reduce points of resistance that may develop immediately to the front or flanks of the unit to

which the tanks are attached. Slow or fast tanks and light or medium tanks may be used, but fast light tanks are best suited to this mission."

For such a mission, the fast tank is a much more flexible weapon than the slow tank. The speed of fast tanks will permit a commander to hold them out of the attack initially, under cover well to the rear, and when hostile resistance stops the foot troops, to push the tanks forward promptly, directing them to neutralize the hostile fire and help the assault units resume the advance. This is equivalent to using his tanks as he does his machine guns or howitzer weapons—employing them against enemy fire that causes him the greatest trouble, and employing them when and where he most needs them.

It is sometimes stated that the fast tank is impractical as an accompanying tank because its speed is so much greater than that of the foot troops which it is to assist; that the fast tank will leave the assaulting foot troops so far behind that they will derive no benefit from its fire power and shock action. The answer to this seems to lie very simply in coordination of tank operations with the advance of the foot troops. While a commander will not limit the operating speed of the tanks, he can coordinate the general forward movement by assigning limited objectives, beyond which the tanks will not move until the ground has been occupied by the foot troops. Tanks in action, of course, seldom advance by a straight route but make many changes of direction in seeking covered routes of approach, in avoiding or neutralizing antitank weapons, and in seeking out and destroying hostile machine guns. Even if these tasks are done at maximum cross-country speeds, the actual rate of advance will at times be but little faster than that of the foot troops.

Thus, the real advantages of speed are that fast tanks require less time to reach enemy resistance, and to search for and destroy, hostile machine guns and other weapons.

Because of this, the time consumed in gaining the fire superiority necessary to permit advance will be materially lessened. Therefore, the assaulting foot troops will advance more rapidly and with fewer casualties.

It is true that experience has proven that tanks do not always succeed in finding the resistance holding up the progress of the foot troops. In this event, due to lack of communication, the tank unit commander will generally find it necessary to go back to the foot troops in order to ascertain the location of the hostile weapons pinning them to the ground. With the old tank, this is a slow process and conducive to casualties of both tanks and foot troops. The fast tank, on the other hand, can go back and obtain data on new targets with less chance of casualties, and with considerably less delay. Thus, in this respect, fast tank support becomes more effective than support rendered by the slow tank.

The fast tank, arriving more quickly on its objective than the slow tank, will have longer to wait for the foot troops and will consequently be exposed for a longer time to antitank fire. The only solution to this problem yet advanced is for the tanks to neutralize all local resistance that can be found, and, then, to seek shelter in the nearest defilade or concealment until the foot troops reach the objective. If suitable defiladed assembly points are lacking, the fast tank will simply have to keep in motion, and take advantage of what cover there is, in protecting itself from antitank fire, unless, of course, it happens to be in a position to deal with the gun that is causing it trouble.

FAST TANKS AS A MOBILE RESERVE UNIT

A large fast tank unit, such as a battalion, has sufficient flexibility to warrant its being held in reserve, in certain situations, until the attack develops the location of the enemy's strength. The British are strong exponents of thus using tanks as we use artillery—to further the commander's scheme of maneuver whenever circumstances permit,

and not restricting the tanks to the zones of action of subordinate units.

British tank units containing both light and medium tanks have been used successfully in this manner in numerous maneuvers. The light tanks overran and went beyond the assigned objective in order to cover the movements of the medium tanks, whose function it was to deal with the objective itself. The close support weapons assisted both the light and heavy units by dealing with antitank weapons that had not been previously neutralized and that frequently appeared where artillery could not be used against them without serious delay, or danger of firing on friendly tanks.

On the other hand, the French adhere closely to the old doctrine of attaching tanks to the battalion. France, unlike Great Britain, has done little toward increasing the speed of her tanks. Whether her doctrine has influenced the speed of her tanks, or her tanks have prescribed her doctrine, is hard to determine. It is possibly significant that she has a large number of slow tanks carried over from the World War that she has not yet put on the scrap heap. Then, too, Britain may contemplate the need for fast tanks in open warfare situations in various parts of her far flung empire, while France is thinking more of masses of European troops that will again confront her in the next war.

In any event there seem to be great possibilities in employing our tanks in large masses to get the thing that we need to win the battle. Assistance is still rendered to the assault units; but maneuver and surprise are less often denied to the tanks. It must be remembered, however, that the flexibility that makes this employment possible depends on control within units as well as speed. Tank unit commanders must be able to go into the fight along with their units and communicate rapidly and accurately with their subordinates. Tank units will need some supporting weapon that can accompany them and protect them from hostile antitank guns when artillery and other support fails. Foot troops will still have to take over and organize the ground that tanks render accessible to them,

whether the tanks are attached to them or not. And in certain situations the allotment of tanks to subordinate units in accordance with old teachings will be desirable.

EXPLOITING TANKS

During the World War, experience proved that the attacker could generally succeed in capturing an enemy position on a more or less limited front provided he could make available sufficient artillery and accompanying tanks. His difficulties usually arose when he had gained the hostile battle position and wanted to exploit his success in order to create a real rupture of the enemy front and launch into a war of maneuver. The attacker found that, although the defender was frequently demoralized and required little more pressing to change defeat into disaster, his own assaulting troops had usually passed beyond the effective support of their artillery and were unable to continue the pressure which they had been exerting. Even with support by certain batteries possible, lack of observation and doubt as to the actual progress of advanced assault units made the artillery fire as dangerous to his own troops as to the enemy.

The slow tanks of that period, generally operating in insufficient numbers on broad fronts, were able to assist the exploitation only by very localized efforts. Before the artillery could be brought up where it could again support the advance, the defender had usually reorganized and was again ready to meet the attack. Additional tanks for exploiting a success were either not available, or too slow in reaching the enemy to be effective. The fast tank, held in reserve by a commander until a success is indicated, should be able to exploit a success, and so gather the full fruits of victory.

At the stage of the battle when exploitation becomes possible, coordination must necessarily be loose. Units advance when and where they can, and their successes often carry along less fortunate adjacent units. Every effort is made to seize important terrain features and block en-

emy routes of retreat; and counterattacks may be expected in the enemy's effort to delay the advance. Under these conditions, a regiment of fast tanks, properly organized and equipped, might be thrown into the fight to seize the essential features of terrain, disrupt artillery that still interferes with the advance, and harass the defender's communications. One of the most important missions of fast tanks thus employed would be to disorganize and scatter the hostile organized reserves in order to prevent counterattacks or the organization of a hostile defense on a new position farther to the rear. It is evident that a commander should use his tanks for this purpose as a united force, giving them a mission which, fulfilled, would cause the greatest embarrassment to the enemy.

A partial disruption of the hostile antitank defense should obviate the necessity of carefully planned supporting fires to protect the tanks. On the other hand, the need of a close-supporting weapon with tank units would be mandatory. And in this regard it is also probable that limitation of support and difficulties of supply would limit the depth to which exploiting tanks could operate, unless they were furnished with more than the usual adjuncts of tank units. For deep exploitations with decisive ends in view, a mechanized force with special training, weapons, means of communication, and mobile supply, would, in all probability, be required.

It is probable, however, that tanks can be used most efficiently as accompanying tanks, in sufficient numbers to insure the cracking of the hostile main position, the remaining tanks being held in reserve as a weapon of exploitation for use at the proper time in the direction and against the objective that offers the greatest opportunity for turning a local success into a real victory. If a flank is available for the operation of exploiting tanks, the chance of success is greatly increased.

FAST TANKS IN THE DEFENSE

The slow tank has generally been thought of as an adjunct of the attack, and the fast tank is also primarily an offensive weapon. But there is no reason to believe that it may not also be valuable to the defense. Our doctrine of the defense teaches that the commander uses his artillery, machine guns, and mortars to fire on known or probable routes of approach in order to disorganize, and perhaps stop, the enemy's attack before it breaks against his defensive position.

A commander can employ fast tanks in mass as a powerful supporting element to be used along with the other weapons in furtherance of his plan of action. In many situations he may give his fast tanks the mission of disrupting the hostile attack by a blow against the assaulting troops. Such a counterattack would be particularly effective where an exposed hostile flank permitted the maximum of surprise in launching it just as the hostile assault units were about to move forward to the attack.

Again, a surprise attack against formed reserves might assure success of the defense, when without such an attack, success was doubtful. And like slow tanks, fast tanks will be used as accompanying tanks in counterattacks launched to restore portions of a defense position that have been overrun. The fast tank's mobility will enable it to take part in more of these counterattacks, accomplish its mission more quickly, and avoid as many casualties. Should the enemy, in connection with his attack, attempt a tank attack against our rear area, our tanks may be employed effectively in antitank defense.

In other words, the fast tank is, like the artillery, a fairly flexible weapon that may be used in several ways in a defensive plan. In sufficient numbers, they should frequently furnish the reserve of power that makes an active defense possible. And their greatest chance of success in launching the offense lies in attacking in force from a flank, or from a covered approach that permits the maximum of surprise.

SPECIAL OPERATIONS

Mobility and dependability should make the fast tank an exceedingly valuable weapon in the special operations of warfare. The unwieldy slow tank, lacking any great power of reconnaissance, was considered as suitable for use only in an advance guard of more than ordinary size or with a fully determined offensive mission. Fast tanks are likely to be in demand by even small advance guards because they form an effective means of brushing slight resistance quickly aside and permitting the column to march without interruption. Ability to travel considerable distances under their own power means that they can often move as an element of the advance guard itself. Occasions may arise when they can be pushed forward from the main body to reinforce the advance guard when it has a definitely offensive mission. Certain missions of reconnaissance may be performed by small units of fast tanks. A platoon of tanks preceding a point may save delay to the advance guard, or even to the column as a whole. Moreover, in a meeting engagement, opportunity may arise to use tanks against the flank or flanks of the hostile column.

In a withdrawal, fast tanks may be able to disengage closely pressed units by a series of counterattacks from the flank. Their increased mobility should often make them more useful as a covering force than less mobile infantry, or cavalry, reserves. During a retirement fast tanks could materially assist the rear guard by harassing and delaying the heads of the pursuing columns.

A unit of tanks would constitute a highly mobile and effective reserve in the hands of an outpost commander.

The possibilities of the fast tank are fully as great in special operations as in the attack and the defense. It may well be found valuable in every situation of warfare. We cannot neglect, however, in any full consideration of the subject, the fact that the problem of production of tanks in a future war is a serious one. In all probability we shall find the supply of tanks inadequate to the need

for them. The employment of tanks in special operations would undoubtedly result in tank casualties numbered in direct ratio to the degree of the enemy's organization for antitank defense. Thus, commanders must carefully weigh the advantage to be gained through using tanks in special operations against the probable losses and the difficulty of replacement.

CHAPTER V

The Battle of Gheluvelt, October 31, 1914

(HISTORICAL MAP PROBLEM)

INTRODUCTION

When, in the closing days of October 1914, the allied battle line extended from the Swiss border to the shores of the North Sea, the extreme left of the line was held by the Belgians, French (Army of Belgium), and the British Expeditionary Force, in that order, from left to right. (See Figure 15, separate map in pocket at end of book.) The British had hoped to launch an offensive in the general direction of Brussels. But this had been abandoned; and the allies, now on the defensive, anxiously awaited the German offensive that they knew was bound to come. It is the I Corps of the British Expeditionary Force, holding the sector in front of Ypres—thirty miles from the North Sea—, with which we deal herein.

This corps was a veteran organization. It had taken part in the Retreat from Mons, the Battle of the Marne, the Advance to the Aisne, and the Race to the Sea. It had been fighting in this part of Flanders since October 19; and although continuous battle had reduced the units to roughly half strength, the morale of the survivors was high, and they were still full of fight.

On 30 October a German message fell into British hands. It stated, in brief, that three corps of the German Sixth Army were to be entrusted with the task of breaking through the allied line to Ypres; and that the Kaiser himself considered the success of this attack to be vitally essential to the successful outcome of the war. Moreover,

a wireless message intercepted on the same day disclosed the arrival of the Kaiser at the headquarters of the German Sixth Army, which was then located in a village nine miles southeast of Ypres.

In view of the expected German offensive, Sir Douglas Haig ordered the line of his I Corps to be held at all costs. For if its position at Gheluvelt should fall, the British would be denied observation to the south, the east, and the northeast. Haig realized, furthermore, that if the Germans captured the Gheluvelt spur, they could attack through Klein Zillebeke in the direction of hill 60, and possibly cut off the I Corps.

The next day, too, (31 October) was eventful. The command post of Sir Douglas Haig at White Chateau, one mile east of Ypres, was visited by Sir John French, commander of the British Expeditionary Force. Sir John was especially concerned about the I Corps situation. General Ferdinand Foch, whom General Joffre had appointed at this critical time to coordinate the operations of the French with those of the British and Belgians in Flanders, also arrived in the vicinity of Ypres. The General spread encouragment, made promises of reinforcements, and did everything in his power to stiffen the resistance of the British. But the most momentous event of the day at Sir Douglas Haig's headquarters was the receipt of word that the long expected German drive had commenced. The enemy was attacking in force.

THE BRITISH 1ST DIVISION

The dispositions of the British 1st Division on the morning of 31 October appear to be unusual. (See Figure 16, separate map in pocket at end of book.) But they are explained by the fact that there had been heavy fighting in front of Gheluvelt on 29 and 30 October. At hard-pressed points in the line, commanders had been forced to send in reserves and reconstitute new reserves from the troops withdrawn from the front lines. We find, consequently, that a number of units had been broken up.

The 1st Division consisted of three infantry brigades—the 1st, 2d and 3d—each of which had four battalions. A few days previously, however, the commander of the 2d Brigade, his headquarters, and two of his battalions, had been detached from the division and sent to another section of the field. The two battalions of the 2d Brigade that remained with the division were placed under the orders of the 3d Brigade commander. This is why the 1st Brigade had four battalions (one only, 1st Battalion Scots Guards, is shown on map) and the 3d Brigade, six; and why there was no 2d Brigade. The dispositions of the 1st Division at daylight 31 October are shown on the Special Map.

The Germans first occupied a hastily intrenched line extending across the front of the 1st Division. At most points, the distance between the opposing front lines was roughly 200 to 300 yards. The intrenchments of both British and Germans had been prepared with infantry tools, and consisted, for the most part, of shallow squad trenches. These were good protection against small-arms fire but almost none against artillery.

SITUATION AS KNOWN TO THE COMMANDING OFFICER, 1ST BATTALION QUEEN'S, 3D BRIGADE, AT 11:15 AM, 31 OCTOBER

At 6:00 AM the Germans launched an infantry attack against the whole line of the British 1st Division. They captured the orchard in front of the 3d Brigade; but at all other points they were beaten off with heavy losses. From the orchard the Germans were able to enfilade the front line of the 1st Battalion Queen's. A counterattack by a platoon of the 2d Battalion King's Rifles failed to retake the orchard. The enemy then advanced his line; and in front of the 1st Battalion Queen's was hardly more than 100 yards away.

Following the failure of his infantry attack against the 3d Brigade, the enemy opened a systematic bombardment

of the entire British line about 8:00 AM. The heaviest fire fell on Gheluvelt and its environs. The fire soon increased in volume and accuracy, and there were many direct hits on the British trenches.

At 9:00 AM a second British counterattack against the orchard was broken up by a hail of artillery fire. And in another half hour the enemy bombardment falling directly in front of Gheluvelt increased measurably in violence.

At 10:00 AM the 1st Battalion Queen's and the two companies of the 2d Battalion King's Rifles still held. Their losses had been heavy during the unprecedented violence of the German bombardment. They had received little support from their own artillery. The wires to the rear were cut, and of the many runners sent, none returned. A number of farm buildings in the salient of the 1st Battalion Queen's were in flames. The heat from these burning buildings became so intense that the defenders nearby were forced to change their positions.

A little later, the German artillery lifted to permit its infantry to assault the British front line. But the defenders rose and delivered such a volume of rifle fire that the Germans reported: "Over every bush, hedge, and fragment of wall floated a film of smoke, betraying a machine gun rattling out bullets." After more than an hour, during which rifle units were unable to advance, the Germans succeeded in working forward enough machine guns to enfilade the British trenches.

Thus, by 11:15 AM, the enemy had driven in the left of the line held by the 1st Battalion Queen's, and this unit had been forced to withdraw to the support position shown by the dotted line on the Special Map. On the right of the 1st Battalion Queen's the two companies of the 2d Battalion King's Rifles were forced to fall back on the other half of the 2d Battalion King's Rifles, which was in reserve west of Gheluvelt.

The situation in the 1st Battalion Queen's was now critical. Less than a hundred men remained. The battalion commander knew that the two companies of 2d Battalion King's Rifles were no longer on his right and that

the Germans were working forward into the gap. He also knew that something had happened on his left, because he could see Germans entering Gheluvelt from the east. The brigade commander's order had stated that the Queen's were not to retire on any account. The battalion commander now had to make a decision. Should he attempt to get out while he still had a chance? Or should he stay, and fight to the last?

REQUIREMENT

Decision of Commanding Officer, 1st Battalion Queen's.

DISCUSSION

The information in the hands of the Commanding Officer, 1st Battalion Queen's can be summarized as follows:

The heaviest part of the German bombardment has fallen on the 2d Battalion Welch Regiment located on the left of the Queen's. It is evident that the line has broken there, because Germans have been seen entering Gheluvelt from the east.

The Germans have also broken through on the right of the Queen's.

The I Corps directed that the line be held at all costs. The 3d Brigade issued the same orders and has not changed them. However, the German bombardment has disrupted communication with the rear; and therefore, the brigade commander may have changed his decision with the Queen's still unaware of it. On the other hand, brigade or higher headquarters may now be sending up reinforcements.

Two courses then, are open to the Queen's: They can attempt to withdraw at once; or they can hold on, at least for the time being.

An immediate withdrawal may enable the Queen's to save a portion of its 100 men; these could be used as a cadre around which the battalion could be reconstituted. But if reinforcements are on the way to the Gheluvelt position, the task of reforming the line through Gheluvelt will be far more difficult should the Queen's now withdraw.

To hold on—even for a while—will gain time for the British; whether the decision of the higher command be to withdraw to a new position in rear, to reinforce the line, or to counterattack. Possibly the commander of the Queen's will receive instructions before long, or perhaps additional information on the situation from another source. But in war, situations seldom clear up, and commanders must often make decisions on information far from complete. The commander of the Queen's must face the situation as it exists and decide for himself what to do.

Soon the time may come when the enemy will advance past both flanks of the Queen's. Then, a further resistance of this small force will be of little or no help to other British units. That will be the time to withdraw. Will the battalion commander be able to recognize this moment when it arrives? It is not likely. What, then, must he do? He must decide now whether the brigade commander, if he knew the situation now existing, would change the order that forbids retirement.

Again, did the British high command expect a German attack of such magnitude? From the information of the enemy and the orders that have come to the Queen's from higher headquarters; from the news of the Kaiser's presence with his troops; and from the brigade order not to retire on any account, there appears to be only one answer. The situation is not unexpected.

The battalion has already proved its mettle by holding out after both flanks have fallen. Less than a hundred men are left. Whether withdrawal or continued defense is decided upon, still greater losses can be expected—even total destruction. Which course is likely to prove of greater benefit to the British cause? The answer seems to be: to continue the defense, at least for the time being.

HISTORICAL SOLUTION

The commanding officer, 1st Battalion Queen's decided to continue the defense. He felt that every further minute of resistance would be of great value to his army. Then, too, there was always the possibility that reinforcements were on the way up.

The Germans who had taken Gheluvelt soon began to fire into the 1st Battalion Queen's from the rear. The survivors tried to fall back and join the reserve just west of Gheluvelt. But it was too late. The enemy had already outflanked and driven back the two half battalions in reserve. As the few remaining men of the 1st Battalion Queen's began their withdrawal, they found themselves surrounded; they were shot down from front, flanks, and

rear. Only two officers and twelve men rejoined the 3d Brigade.

SITUATION AS KNOWN TO THE COMMANDING OFFICER, 1ST BATTALION SOUTH WALES BORDERERS, 3D BRIGADE, 31 OCTOBER

While the gallant but hopless resistance of the 1st Battalion Queen's has been resulting in the virtually complete destruction of that unit, the other British units have had their own desperate situations to meet. The 1st Battalion South Wales Borderers, whose place in the line was just to the north of Gheluvelt (second unit to the left of the Queen's), have likewise been hard pressed.

At 6:00 AM the Germans launched an attack against the Borderers and the units on their right and left. It was repulsed without difficulty. Toward 7:00 AM the Scots Guards, on the left of the Borderers, captured fifty-eight prisoners. They were so depleted in numbers, however, that they had to borrow an escort from the Borderers in order to get the prisoners to the rear. At 8:00 AM the enemy began a violent and searching bombardment of the Borderers and adjacent battalions. The shelling was especially heavy around Gheluvelt.

At about 9:30 AM the commanding officer, 2d Battalion Welch Regiment, which was on the right of the Borderers, visited the Borderers' command post. He stated that the right half of his line had been blown out of the trenches and that he was withdrawing the remnant of the right half of his battalion to his support line. But a few minutes later, on reaching his support position, which was along a sunken road, he decided that it was poor, and continued through Gheluvelt to a position a short distance northwest of the town. There he rallied about 100 men from the broken right and established them in a position directly in rear of the left half of his battalion, which was still holding its original position.

This withdrawal of the right half of the Welch created

an exposed flank at a point 200 yards north of the Gheluvelt—Menin road.*

The shelling had gone on continuously since 8:00 AM; and at 10:00 AM, the line north of Gheluvelt was attacked by the enemy infantry. Severe fighting—almost hand-to-hand—ensued. The small woods in front of the 1st Battalion South Wales Borderers gave some protection. They were too dense for the enemy to penetrate. Hence he was unable to observe his artillery fire in this sector. The Borderers held on bravely. About 11:45 AM, however, the Germans entered Gheluvelt. The single company of the 2d Battalion Welch Regiment that remained on the line, was overwhelmed, and its thirty-seven survivors captured.

By 12:30 PM, the right half of the Borderers' line had been forced back and to the northwest through the chateau grounds west of the chateau. There, the battalion commander organized a counterattack, using his headquarters personnel, a few men from the Scots Guards, and what remained of his two right companies. It was successful. The Germans were driven back, and the line was restored along the wall in front of the chateau grounds just west of the road.

The commander of the Borderers then sent a written message to his brigade commander (3d Brigade) asking for reinforcements in order to block the gap on the right and retake Gheluvelt. It so happened that the command posts of both the Borderers and the Scots Guards were located in the stables of the chateau. In a short while the Borderers received a reply to their message over the 1st Brigade—Scots Guards—telephone. The 1st and 3d Brigades ordered the Scots Guards and Borderers to retire

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*It is not known whether an attempt was made to inform the 1st Battalion Queen's of the withdrawal of the right half of the 2d Battalion Welch Regiment. If this action was undertaken, it was not successful, because the sight of the Germans in Gheluvelt was the first indication to the Queen's that the line on their left had broken.

to the woods 800 yards north of the chateau. But almost immediately afterward, the 1st Brigade cancelled the order for the Scots Guards to retire.

And when the commander of the Borderers learned that the Scots Guards had been ordered to remain, he was forced to make a decision. He had no wire communication with his own brigade headquarters.

REQUIREMENT

Decision of the Commanding Officer, 1st Battalion South Wales Borderers.

DISCUSSION

The order directing both the Scots Guards and the Borderers to withdraw to the edge of the large woods north of Gheluvelt is understandable; but an order directing the Borderers alone to move to this position is not. For this will remove the battalion from all participation in the defense of a vital area (the Gheluvelt ridge) at a time when that area is seriously threatened. Furthermore, it will expose the right flank of the Scots Guards. The battalion commander must undoubtedly feel that, if the brigade commander were familiar with the circumstances, he would cancel this order. In fact, it is even reasonable for him to assume that the brigade commander has already attempted to cancel the order.

In view of these things the Borderers' battalion commander should decide to remain in his present position—at least for the time being. Then, over the Scots Guards' telephone line, he should request the 1st Brigade to inform the 3d Brigade of his decision.

HISTORICAL SOLUTION

The commanding officer, 1st Battalion South Wales Borderers decided to remain in his present position. It is not known what steps he took to communicate his decision to his brigade commander.

CONTINUATION OF SITUATION

3d Brigade.—The German attack at 6:00 AM was repulsed along the entire division front; but at 10:00 AM, as we have seen in recounting the desperate straits of the Queen's and the South Wales Borderers, the Germans renewed the attack with considerable success, after a heavy artillery bombardment.

About noon, while the final struggle of the Queen's was going on and the Borderers were having their fight in the chateau grounds, the situation in the whole 1st Division became critical. From Gheluvelt to the right boundary of the division, both inclusive, the line had been forced back. Greatly reduced in numbers, the defenders were attempting to rally on the line in front of Veldhoek. "The area behind Gheluvelt," says the British Official History, "presented a scene that to the onlooker seemed to exhibit every element of disaster. The two battalions of artillery which had been supporting the troops at Gheluvelt * * * were retiring; wounded and unwounded men were drifting back singly and in groups; and the deadly hail of shell which swept the ground was approaching nearer and nearer to Hooge."

The commander of the 3d Brigade, having seen his reserve driven from the woods west of Gheluvelt, and having learned soon afterward that the Borderers and the Queen's were still holding, ordered the 1st Battalion Gloucestershires, who were in position in front of Veldhoek, to counterattack toward Gheluvelt. The Gloucestershires advanced to the attack, picking up men from the 2d Battalion King's Rifles and the 1st Battalion Lancashires. But this attempt also failed.

The brigade commander, who had employed all of his reserves, now ordered a retirement to the former position in front of Veldhoek, where he hoped to stop the German advance. Thus the remnants of four battalions of the 3d Brigade were formed in a thin line in front of Veldhoek, joined up with the units on the right. The Borderers and the Queen's were abandoned to their fate.

1st Brigade.—All during the morning, General Fitz-Clarence, commander of the 1st Brigade, was in close touch with the fight. In addition to conferring by telephone with his battalion commanders, he, or Captain Thorne of his staff, went forward from time to time, to visit the units of the brigade at intervals during the morning. Soon after countermanding the retirement order for the Scots Guards, General Fitz-Clarence collected his last reserves—about one and one-half companies—, and posted them west of the railroad and about 400 yards northwest of Gheluvelt (behind the right flank of the Borderers). He then rode toward Gheluvelt on reconnaissance.

It was soon obvious to General Fitz-Clarence that Gheluvelt was lost. Large enemy reinforcements were coming up. And unless immediate steps were taken, the British line, now pierced, would be completely broken. The general galloped back to his command post and told the division commander how desperate the situation was.

The 1st Division had no reserves. By this time all of its units were badly used up. By previous arrangement, however, the 1st Division had been authorized to call upon the reserve of the 2d Division. Upon learning that Gheluvelt had been lost, the division commander directed General Fitz-Clarence to call on the 2d Division reserve. The division commander also placed at the disposal of General Fitz-Clarence one battalion of artillery with 18 guns, the observation post of which was in the southwest corner of Polygon Wood.

The reserve which thus became available to General Fitz-Clarence was the 2d Battalion Worchestershires. It was assembled in the draw 200 yards northwest of Polygon Wood, and had but three rifle companies—a total strength of 357.

REQUIREMENT

Decision of General Fitz-Clarence as to the use to be made of the 2d Battalion Worcestershires.

DISCUSSION

General Fitz-Clarence could grasp the situation much more clearly than the commanding officer, 1st Battalion Queen's, who had to decide about 11:30 AM whether to continue the defense or withdraw. For he has been in touch with the battalions of his brigade throughout the morning and has talked to the division commander within the last few minutes. It seems reasonable to assume that the division commander knows—at least in a general way—what General Fitz-Clarence plans to do. This being the case, General Fitz-Clarence may well feel that his decision will have the approval of his superior. It is also safe for him to assume, moreover, that there has been no change in the missions assigned the 1st and 3d Brigades.

There are now three courses open to General Fitz-Clarence:

(1) He can place the 2d Battalion Worcestershires in position along the spur south of Polygon Wood, and then withdraw the Borderers, and the troops on their left, to a new position in rear, under the protection of the Worcestershires. The road in rear of, and parallel to, the railroad appears to be a good line upon which to reform the Borderers and their neighboring units. By this, the salient at Gheluvelt would be eleminated, and the threat to the flank and rear of the Borderers and the Scots Guards removed. The new line would connect with the Gloucestershires and other units in front of Veldhoek. On the other hand, such a withdrawal in daylight might result in losses so serious that the new line could not be held. Furthermore, the previous order to withdraw was cancelled only a few minutes ago. The immediate reissuance of this order would savor of vacillation. And the apparent fact that the high command did not know its own mind might all too readily have an adverse effect on morale at this critical time.

(2) He can leave the Borderers and Scots Guards where they are, and move the 2d Battalion Worcestershires up to support the small force of a company and a half now post-

ed about 400 yards northwest of Gheluvelt. Here the Worcestershires would become a connecting group between the Borderers and the Gloucestershires. This would cover the rear, but not the right flank, of the Borderers. Furthermore, this position, exposed to the observation of the enemy in Gheluvelt, has not been organized or intrenched, and cannot be occupied without heavy losses. This solution, however, might enable the Borderers and Scots Guards to hold their present positions until dark.

(3) He can use the Worcestershires in a counterattack to recover the important position of Gheluvelt. As matters now stand the enemy is temporarily checked. And there is actually an opportunity to strike him in flank at a time when he is ill prepared. The Worcestershires are fairly well disposed for such a counterattack; they can be moved through Polygon Wood and thence to the southeast. Artillery support is available, and, since the ground permits good observation, this support should be effective. General Fitz-Clarence and his staff are familiar with the terrain and intimately acquainted with the situation of their own troops. They also know the location of the enemy. But despite the fact that these factors seem to favor success, the risk will be considerable because of the enemy's advantage in numbers and armament. At the same time, it must be remembered that the other two courses, neither of which will accomplish as much, are also difficult of execution.

Should the fact that the Worcestershires are the last reserve at the disposal of the division preclude their use for a counterattack? In this situation the answer is "no," because the division commander has placed the battalion at the disposal of General Fitz-Clarence without any limitation on the way it is to be employed. Therefore, the decision to counterattack at once with the Worcestershires and retake Gheluvelt, appears sound.

HISTORICAL SOLUTION

General Fitz-Clarence decided to counterattack at once with the Worcestershires, from Polygon Wood, and recover Gheluvelt.

CONTINUATION OF THE SITUATION

General Fitz-Clarence immediately sent a message to the 2d Battalion Worcestershires, directing that an officer be sent to the 1st Brigade command post for orders. The battalion adjutant was designated, and promptly reported. Captain Thorne of the 1st Brigade staff was also present. It was then 12:40 PM.

REQUIREMENT

Actions and orders of General "1st Brigade" in carrying out the decision to counterattack.

HISTORICAL SOLUTION

General Fitz-Clarence spent about twenty minutes with Captain Clarke, the battalion adjutant. Together they studied the map and the ground. The general explained in detail what the battalion was to do. The adjutant was then sent back with orders directing the battalion to prepare to launch a quick, vigorous counterattack in order to restore the position in front of Gheluvelt. The battalion was directed to attack to the southeast through Polygon Wood, and pass to the right of the 1st Battalion South Wales Borderers. The brigade commander also sent word that he would visit the Worcestershires presently, and personally give his order to the battalion commander.

General Fitz-Clarence then made arrangements for a battalion of artillery to support the counterattack, and immediately afterward proceeded to the Worcestershires headquarters where he gave the battalion commander the following order: "Advance without delay, and deliver a counterattack with the utmost vigor against the enemy who is in possession of Gheluvelt; and reestablish our line there."

The General also placed Captain Thorne at the disposal of the Worcestershires to guide them clear of the right flank of the 1st Battalion South Wales Borderers.

DISCUSSION

Much can be learned from studying the actions and orders of General Fitz-Clarence in this fight. The many accounts that mention this leader's name are unanimous in their praise.

As we have seen, General Fitz-Clarence had visited his battalions from time to time. He knew where they were and how they were. He knew the terrain and tactical situation in his own sector; and he had also reconnoitered toward Gheluvelt, which lay in the sector of the other brigade of his division. General Fitz-Clarence was in touch with his neighbor, General Landon of the 3d Brigade, and

his division commander, General Lomax. It is plain that General Fitz-Clarence was taking a broad view of the situation, and not limiting his activities to his own brigade, less heavily engaged than its neighbor on the right.

General Fitz-Clarence, moreover, was known to the personnel of his command and neighboring units as a real leader—one who looked out for their interests.

We saw him send for a representative of the Worcestershires to take orders, and when that officer arrived, spend twenty minutes with him in conference, studying the map and the ground as the general explained what the Worcestershires were to do. The details of this meeting are not fully known. But we can see General Fitz-Clarence going over any doubtful points with Captain Clarke. And we feel that when Captain Clarke left the command post to return to his battalion, he understood thoroughly what the brigade commander wanted. And as a final touch, a staff officer who knew the situation and the terrain, was sent to the Worcestershires in the capacity of guide. After Captain Clarke had gone, General Fitz-Clarence attended to the artillery support, informing the artillery battalion commander of the counterattack plan, and making certain that the artillery could carry out its part.

Since every minute counted, one is inclined to wonder why General Fitz-Clarence did not go at once to the Worcestershires and give his order personally to the battalion commander, or send a staff officer, and thus save a few minutes. Perhaps he could have done so. Perhaps, he had not yet made his decision and wished to use a few minutes for that purpose. It may have been that the arrangements for artillery support could be made more quickly from his command post than from anywhere else.

General Fitz-Clarence then went to the 2d Battalion Worcestershires and gave his order personally to Major Hankey, who commanded that unit. The general assured Major Hankey of the artillery support. The reasons for this personal visit to the Worcestershires were: to show himself to the troops, to encourage them, to give Major Hankey an opportunity to clear up any questions that may

have arisen, but above all, to make sure that the battalion attacked as directed. This was the critical place and the critical time. General Fitz-Clarence was there and dominated the situation.

It appears that this brigade commander had a definite idea of what he wanted the Worcestershires to do, that he adopted a sound means of insuring that his will was carried out, and that any commander in a similar situation might well emulate him.

CONTINUATION OF THE SITUATION

The terrain to be crossed after leaving Polygon Wood was devoid of cover and crossed by a number of wire fences. Wounded men and stragglers could be seen coming to the rear across this ground.

There was no further information of the enemy.

It is 1:05 PM.

NOTE.—It is not known whether the machine-gun section of the Worcestershires was present at this time. Consequently, it will be assumed, as is highly probable in this case, that the machine guns have been committed previously and are not available to the battalion commander.

REQUIREMENT

Detailed plan of Commanding Officer, 2d Battalion Worcestershires for the counterattack, to include:

Place of deployment.

Formations:

(1) In passing through Polygon Wood and vicinity.

(2) In crossing open spur just southeast thereof.

HISTORICAL SOLUTION

The first action of the battalion commander was to send a number of men forward to cut the wire fences which the battalion would have to cross. Most of these men were killed or wounded by enemy artillery. Before the advance began the men were told to discard their packs, and extra ammunition was issued. The companies were then moved about 600 yards southeast in column of squads. This move was defiladed by the spur running northeast from RJ 56, and further screened by Polygon Wood and the woods east of Polygon Wood.

The battalion was then deployed in two lines. Companies C and D, C on the right, formed the leading wave. The third company, Company B, deployed in line fifty yards in rear of the leading wave. A small party under an officer covered the exposed right flank.

The first two hundred yards were covered in one long rush. Upon seeing the battalion pass over the spur, the enemy redoubled his artillery fire of shrapnel and high explosive. More than one hundred men fell; but the remainder pressed on rapidly and soon gained contact with the enemy. The Germans on the right, and in rear of, the 1st Battalion South Wales Borderers were surprised and quickly driven back through Gheluvelt in confusion. The Worcestershires reached the sunken road and there established themselves with their right at the point where the road from the chateau to Gheluvelt turns to the southeast.

In this position the battalion received heavy rifle and machine-gun fire from Gheluvelt, and promptly sent out patrols which cleared the greater part of the town. At 3:45 PM the battalion commander reasserted command over his fourth company, Company A, which earlier in the day had been posted by brigade behind the railway about 300 yards northwest of the town. He ordered it to rejoin the battalion. Company A came up at once and went into position on the right rear of the battalion line in order to protect the exposed flank. This company also sent patrols into the town to assist in clearing out the enemy.

Soon Gheluvelt was again definitely in British hands, and so it remained until the end of the day.

General Fitz-Clarence accompanied the battalion to its place of deployment and remained there until he saw that the counterattack was successful. He then galloped back to Polygon Wood and reported the result to division headquarters.

On the morning of this operation the total strength of the 2d Battalion Worcestershires, including Company A which rejoined the battalion after the counterattack, was 11 officers and 450 men. Their casualties on this day were 3 officers and 189 men. It is known today that thirteen German battalions, at least six of which were fresh, attacked the Gheluvelt line between the sector of the two companies of the 2d Battalion King's Rifles on the south and the 1st Battalion Scots Guards on the north, both inclusive. Reports indicate that the total number of British defending this line after 10:00 AM was barely 1,000.

SITUATION IN THE BRITISH I CORPS

The first news of the loss of Gheluvelt reached the headquarters of Sir Douglas Haig's I Corps about noon. About 12:30 PM further news came in that the line of the 1st Division was broken and that the counterattack of the 1st Battalion Gloucestershires had failed. Later on, word was received that the half battalion on the right (Lancashires) had been destroyed and that the gap at Gheluvelt had been widened. Corps headquarters informed General Foch, and the commander of the French corps on the left of the British I Corps, of these developments.

Sir Douglas Haig left his headquarters and rode forward toward Hooge to see the situation for himself, and to do what he could to restore confidence. After satisfying himself as to the state of affairs, he returned to his command post. At 1:30 PM he issued orders for a new line to be established one mile west of Veldhoek—this to be held at all costs.

At 1:50 PM it was learned at I Corps Headquarters that

a bombardment by German artillery had fallen on the command posts of the 1st and 2d Divisions in the chateau at Hooge, fatally wounding one division commander, stunning the other, and killing or wounding almost the entire staffs of both divisions.

About 2:00 PM Sir John French, commander of the British Expeditionary Force, arrived at headquarters I Corps and learned of the situation. Realizing that all British sources were exhausted, and that his only hope lay in obtaining aid from General Foch, General French did not remain long. About 2:30 PM he set out on foot to regain his car and go in search of General Foch. Almost immediately afterward, the I Corps received word that Gheluvelt had been retaken by the counterattack of the Worcestershires and that "the crisis was—for the moment at any rate—past". At General Haig's order an aide ran after General French and managed to overtake him with the good news just as he reached his car.

By a second coincidence shortly thereafter, the British commander chanced to pass through a town west of Ypres where General Foch was paying a visit to the headquarters of a French unit. Sir John French was thus able to give General Foch the latest information on the situation in front of Ypres and renew his requests for reinforcements, almost without delay.

CONCLUSION

The foregoing problem, based upon the Battle of Gheluvelt as described in the British Official History, has presented a number of interesting points.

Let us first consider the organization of a defensive position. At this stage of the World War, defensive positions were more in the nature of "lines" than "areas" as we look upon them today. Our present doctrine attaches less importance to the foremost elements of the battle position and disposes the defenders in greater depth. In the future we may expect a profusion of automatic weapons and an increase in the fire power of the defenders without

many men actually on the position. Under these conditions the loss of a part of the position will not occasion so much alarm. As a sidelight on the Gheluvelt operation, it appears that the fact that the British held their front line so stubbornly deceived the Germans into thinking that there were large reserves in rear.

Second; we see that the missions and actions of smaller units are dictated by conditions beyond their control. The high command had decided that the retention of the Gheluvelt position was of the greatest importance; and their reasons for so deciding were doubtless sound. The result was, however, that the units upon which the main blow of the enemy fell were faced with a situation calling for the greatest courage and sacrifice.

We see, as a third point, how commanders often have to make decisions upon incomplete information. Sometimes these situations arise quickly and unexpectedly. Sometimes they develop gradually; and unless the commander is on the alert, he finds himself already committed to, or involved in, a course of action from which there is no turning.

Again, we may ask, "Is a commander ever justified in launching a counterattack against great odds with his last available reserve?" At Gheluvelt a commander did so, and succeeded, with results so far-reaching, in fact, that the counterattack of the Worcestershires became one of the classic operations of the World War. But we must not draw generalizations from a single successful operation. For that matter, it is unsound to draw any generalizations. What worked once may not work next time; and some method not tried might have worked even better.

We find, furthermore, an unusually high degree of cooperation between neighboring units. From further research, we learn that the commanders of the 1st and 2d Divisions had decided, if the enemy broke through, to use their reserve—to be furnished by the 2d Division—in a counterattack from the north. Similarly, the interests of the two brigade commanders did not stop at the boundaries of their sectors. They remained in close touch and

worked for the common good. In the battalions on the boundary between brigades, we find the commanders of the 1st Battalion South Wales Borderers and 1st Battalion Scots Guards in close liaison assisting each other. It is not to be denied that this one factor—cooperation—had a great deal to do with the outcome of the battle.

Finally, it is apparent as always that much depends upon personal leadership. The counterattack succeeded for a number of reasons. But one of the foremost was the brilliant personal leadership of General Fitz-Clarence.* Another decision carried into execution with as much skill and energy might also have succeeded. It does not matter who originated the idea for the counterattack. What counted was that the decision was actually made, and then carried out so well that the position of the corps was sufficiently reestablished to cancel the withdrawal Sir Douglas Haig had decided was necessary.

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*General Fitz-Clarence was killed in action November 11, 1917.

CHAPTER VI

Planes and Bullets

(Lieutenants GROUND and AIR have not seen each other for five years. From 1926 to 1929 they worked together in the Third Section of The Infantry School where they had a hand in the first developments of infantry antiaircraft training. Since then, AIR has transferred to the Air Corps and is now a pilot in an attack group. Now AIR has flown over to spend a day or two with GROUND, and the two are talking over the changes that have come about since their earlier association.)

AIR.—Well, old man, I suppose you've just about discarded the old ideas we used to get so excited about.

GROUND.—Which ones do you mean? We had a lot.

AIR.—I mean the idea that a doughboy could shoot down a plane with his rifle, and all that.

GROUND.—No, Air; we haven't exactly thrown them out yet. We still think we can hit 'em.

AIR.—Aren't you losing track of the fact that attack ships fly around 200 miles an hour now? When they flew from 120 to 150, perhaps there was some chance of winging one. But I don't see how you expect to do much of anything against planes at modern speeds. Every army is getting 200-mile-an-hour ships now. And I know when we attack now we're there and gone. The poor doughboy hasn't much chance these days to lead the plane and use his sight or tracers, or whatever you have now.

GROUND.—Look here, Air; how big is a plane? The front half or third of the fuselage, I mean, where all your tender spots are? It's as big as a barn door, roughly speaking; isn't it?

AIR.—Well, yes; it's a yard wide and about four or five long.

GROUND.—Now then; how low does a pilot fly at 200 miles an hour?

AIR.—If it's level ground, with no trees or telephone poles, he can scrape pretty low—20 feet. A good pilot can get less than ten feet from the ground. You know the French call it "vol à terre rasant", "skimming-the-ground flight".

GROUND.—Well you used to be a good shot, Air. Don't you think you could hit a barn door at 10 feet, even if it moved by you at 200 miles an hour. You could throw a stone at it and hit it once in a while, couldn't you?

AIR.—Sure. But I might not be able to if some one were sitting on it throwing stones at me.

GROUND.—Fair enough. But all men on the ground aren't right under the attacking plane. The plane covers only a narrow strip with its fire. Even three planes abreast, attacking at a height of 10 or 20 feet don't spread their bombs and bullets very wide. Not much over 100 yards. The ground troops outside of that strip won't be in the fire of the plane at all.

AIR.—Isn't 100 yards plenty wide enough to smear up a column on the march?

GROUND.—Sure it is, if they're all on the road or close to it. Before we go any farther, though, let's get one thing straight. Six years ago, when we were thinking a lot about this subject and working on it together, you may remember that I tried to bring out the point that the attack on the marching column is the least likely and least reasonable to assume. In the first place, other considerations than aerial attack will make us do as much of our marching at night as we can. There will be times, all right, when we'll have to move by day; but most moves will be night moves. And all moves possible, whether by day or night, will be made with widely dispersed units and with fast-moving motor transportation. Then, in the second place, the primary targets of attack aviation are biv-

ouacs, hostile airdromes, and supply areas, as well as lines of communication and troops on the march. All the foreign air branches list these things as primary targets, and I believe we do too. In short, then, the majority of targets of attack aviation are areas roughly circular in shape, rather than long narrow strips like a road.

AIR.—You're right. The attack on the marching column in the day time is the exceptional, and not the usual, target. However, defiles, bridges, and communication roads are prime spots for us. A bridge full of troops is at our mercy.

GROUND.—I agree with you, basically. But a bridge or a defile of any kind is too important to ground troops for them to neglect. Any bottle neck we have to squeeze through will be surrounded by ring upon ring of antiaircraft defenses. Thus it will actually be an area of considerable breadth that you are attacking and not a single narrow point.

AIR.—But I still think you won't hit often enough at 200 miles an hour to bother us much.

GROUND (laughing).—O.K., fellow. Right where we started again, aren't we? I'd like to bring up one more preliminary point before we hash this subject over any farther, and before I say any more about whether we can hit 200-mile-an-hour planes or not. When members of the Air Corps and the Infantry get to talking about what we're discussing, it's easy for it to get no farther than for the flyer to say: "Well, anyway, we can shoot hell out of you"; and for the doughboy to reply: "Maybe so; but we can shoot hell out of *you* while you're doing it." Personally, when that happens, I'm inclined to think we're both right to a certain extent. And the more I study the subject the more I think so. But first here is my suggestion: When the next war comes we're going to be fighting the enemy's air corps and not our own. So; as we continue to discuss these things, let's keep in mind as much as possible what other nations are thinking and doing in the field of attack aviation, as well as our own.

AIR.—That's a good point. The real contest is not between your branch and mine but with the enemy. As a matter of fact we need to know and study every development of foreign antiaircraft ideas, too, and not confine ourselves to thinking about what our own ground troops are doing.

GROUND.—I only brought the idea up for the sake of keeping our minds open as broadly as possible while we're talking things over. Now, let's get back to Topic *A*: Can we shoot you down at 200 miles an hour, or not?

AIR.—Wait a minute; you mean can you shoot down *the enemy's* attack planes at that speed, don't you?

GROUND.—Right. That's a horse on me. Here's my answer. There is no doubt in the world that a plane moving 100 yards a second—200 miles an hour—is a mighty fleeting target and a difficult one to hit. But there are several things that make it not quite so hard a thing as it seems. In the first place, no matter how fast a plane moves, it takes a soldier only two or three seconds to aim and fire at it hurriedly. Now, even if the faster speed of today's attack plane does cut down the number of seconds' warning of its approach that troops will have, they will still have more than two or three seconds. In fact, they will have about 15 seconds on the average, sometimes more, and sometimes less.

AIR.—How do you arrive at that?

GROUND.—In this way. You may recall that five or six years ago, tests were made at several different places to find out how long a warning troops had of the approaching attack. Unexpected simulated attacks were made against infantry on varied terrain, and the time elasping from when the troops first heard the approaching planes to the moment they passed overhead was measured with stop watches. Both the Infantry and the Air Corps made such tests. And the average time of warning was 20 seconds. It was seldom under 12 or 15, or over 30, seconds. Now, the airplanes used in those tests had a speed of 130 to 150 miles an hour. The modern attack plane moves 180 to 200 miles an hour. Hence by inverse proportion it's easy

to figure that the average warning time has probably been cut from 20 to 14 or 15 seconds by the faster planes. Certainly the planes of today make just about as much noise as those of the past, and can be heard just as far away.

In the individual case of the man on the ground, of course, the length of the warning varies greatly. Suppose planes are attacking over irregular ground like this. (GROUND draws the sketch in Figure 17.) Men up there on the high ground at *A* may easily hear the planes coming several miles off. Out on the reservation here you can stand on Davidson hill and hear a plane as soon as it takes off at the landing field 2½ miles away. The man down at *B*, however, may not hear it until it comes within a few hundred yards of *A*. In fact, if he's on very low ground behind a local depression as in *C*, he may not hear the planes until they have reached a point almost over *A*. A man up on *D*, again, will have considerable warning.

AIR.—That all seems reasonable enough, Ground, but won't local noises such as the talking and tramping of troops, interfere with your hearing the planes?

GROUND.—They would, except for the fact that there will be men out away from those noises, where it's quiet, always listening for their approach. I might say here, incidentally, that the 15-second warning time I've just been telling you about doesn't take into consideration special listening devices or anything of that kind. Undoubtedly such things would lengthen our ears a lot. Listening devices to detect the approach of planes, and their direction, too, with considerable accuracy, are now in a high state of development. But we can't load ourselves down with all kinds of special equipment. It seems apparent, though, that mobile listeners would be of great value for bivouacs, airdromes, rear area installations, and especially as a part of the antiaircraft defenses around important defiles.

AIR.—(Examining the sketch—Figure 17—again.) Look here, Ground, you've been talking about *hearing* the planes approach; but how about *seeing* them approach? A man has to see a plane before he can shoot at it, unless he's just

going to let fly up in the air in the general direction of a noise. This fellow down here at *B*, I don't see how he can fire until the planes appear over *A*, unless he's like the man my father used to tell about, who had a shotgun with a curved barrel for shooting around corners.

GROUND.—I hadn't got to that yet. You're quite right. The man at *B* might *fire* a curve over *A*, but he certainly can't *see* over it in a curve. He can't take aim at the air attackers until they clear the crest, and if he's where *C* is, he may have to wait still longer. *B* and *C*, especially if they're in the woods, may get only a single shot in, just before the planes pass overhead. Of course, men up or down the valley from *B*, may get more of a side view of the planes as they cross it, but they'll have only a short time to fire, too. Unless there are woods to shut them off, they can fire while the planes cross from *A* to *D*.

AIR.—I don't think anybody in the valley will have so much time to fire, whether it's wooded or not.

GROUND.—That's not hard to figure. If the valley is 1000 yards wide, it will take 200-mile-an-hour planes 10 seconds to cross it. If we assume that men directly under the path of the plane fire at it until just before it passes over their heads, *B* will have slightly under 5 seconds to shoot at it.

AIR.—Then *B* will be lucky to get in more than one shot.

GROUND.—No. With a clear view he should get in two shots. Don't forget that he will hear the planes a few seconds before they come in sight. He'll know the general direction of approach and be ready to aim and fire his first shot quickly. That gives him a good 3 seconds for a second shot; which is long enough. The soldier at *C*, of course, gets just one quick shot as they go over.

But anybody up or down the valley from *B*—if we assume that the planes pass directly over *B*—will have the whole 10 seconds of their passage across the valley in which to fire at them. He gets three shots in, at least.

AIR.—How about men on the high ground like *A*?

GROUND.—*A*, and all others well up the slope just below *A* to the right, will have the longest warning, and conse-

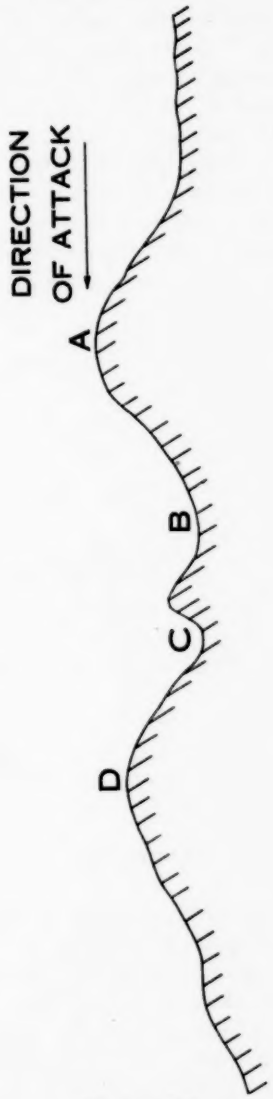

FIGURE 17

quently the most time to get ready, and to fire, of any men who happen to be under the path of attack. Unless woods interfere, men on high ground should be able to open fire at a range of about 1,000 yards, and continue firing until the plane passes overhead.

AIR.—Aren't you forgetting that *A* is fully exposed to the fire of the attacking planes? I don't think he'd last very long.

GROUND.—Possibly not. He does stick up in full view, doesn't he? But look here. (GROUND draws Figure 18.)

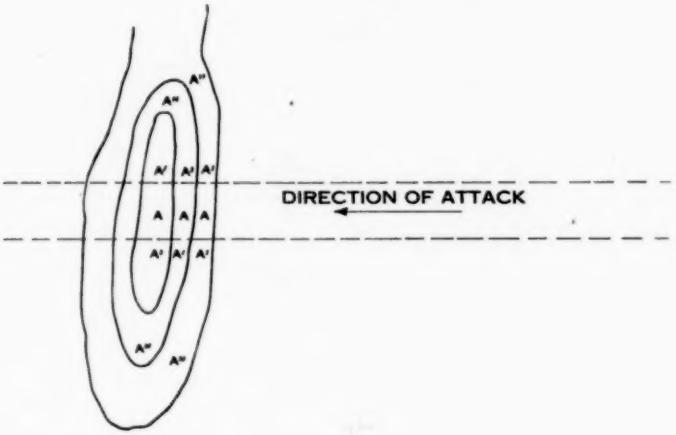

FIGURE 18

Here, at the left, is the same ridge *A* was standing on in the other sketch (Figure 17).

The dotted lines show the path of the attack, 100 yards or more wide for 3 planes abreast. Now *A* is in the path of the attack, but *A'* and *A"* are not. Whether he's on the top of the ridge or down the slope, every man outside the path of the attack is free to fire at the planes, without danger from their bullets and bombs. *They* should all be

able to fire about three aimed shots, even if *A* and the men near him become casualties.

AIR.—It seems logical that men on high terrain like that could have the best chance to fire; but attack planes fly so low that I doubt if many could open fire at 300 or 400 yards, let alone 1000.

GROUND.—That brings up a point I would certainly like your opinion on: the minimum height of flight at 200 miles an hour. Just how close to the ground do you think the average pilot can fly at that speed? I mean, of course, with reasonable safety.

AIR.—Well, Ground, like most things in war—and in life, too, for that matter—the minimum altitude depends on several factors. The wind and weather—whether there's fog, or rain—affect it, of course. But the main thing, I should think, is the terrain. On an open flat desert, or over water, a man can fly with his wheels almost scraping the ground.

GROUND.—Doesn't he have to be pretty good to do that as a usual thing, especially at 200 miles an hour?

AIR.—Well, it does require considerable experience; or rather, practice. And any attack pilot will have that.

GROUND.—Not long ago I flew on a simulated attack mission, during which we went down over a lake for 10 or 15 miles. We were using the bank of the lake to cover our approach. The pilot of the leading plane was one of the best flyers in the country—a man considered to be a skillful, although not particularly a reckless, flyer by all his fellow flyers. I noticed that he stayed about 15 feet off the lake. We were flying about 140 miles an hour and the air was calm.

AIR.—That's about as low as a man would fly over water for any distance, unless he were concentrating on getting very close to the surface. And on level land it would be about the same.

GROUND.—How about over trees?

AIR.—He would make at least 10 or 15 feet allowance, I should say, unless there, too, he was trying to see how

very close he could scrape. In broken country his minimum altitude would vary somewhat. He can't dip into every little ravine or clearing, of course. At 200 miles an hour he has to fly generally a little above the highest obstacles.

GROUND.—Here; let me draw a profile of a piece of ground. (Figure 19.) Now let's say that it's 800 yards from *A* to *B*, and a plane flies from left to right. 800 yards is 8 seconds' flight. Now take the pencil and draw the path of the plane. (AIR draws in the heavy line.)

AIR.—My line is intended to pass about 10 feet above the highest trees.

GROUND.—Then, if the trees run about 40 feet high, with tall ones a little higher, the plane never gets closer than approximately 60 feet to the ground except in fairly sizeable open stretches. I've watched planes many times in simulated attack, both from the ground and from the air. I have also measured the height with field glasses, and I always get about that minimum figure, even where the trees are thin and scattered.

AIR.—What is the particular importance of the point?

GROUND.—It is important in this. That 20 yards of altitude requires the forward guns on attack planes to be fixed at a slight downward angle in order to obtain continuous fire upon the ground passed over. Or else the pilot has to raise the tail of his plane whenever he attacks—which has the same effect—in order to keep his bullets from going all over the countryside. Notice the arrows I've put on the sketch here at *C* and *D*, and *E*. (Figure 20.) They may be exaggerated a little, but they give you the idea.

AIR.—Yes, you're quite right there.

GROUND.—But the main point I'm driving at is this: when guns are set at a downward angle big enough to keep all their fire on the ground—and, incidentally, to make it safe for any friendly planes in the next 2 or 3,000 yards ahead—that angle reduces the danger of the machine-gun fire to the foot troops.

FIGURE 19

FIGURE 20

AIR.—How can fixing the guns at a downward angle increase the fire and decrease its danger at the same time?

GROUND.—What I mean is this: From just a few feet off the ground, the fire of the attack plane's guns, if it is approximately horizontal to the path of flight, has a very small angle of fall as in Figure 21. Hence each bullet creates a very long danger space as it skims along almost parallel to the ground. But such fire, as I said a minute ago, would be scattered all over the landscape, if the terrain is even partly wooded or in the least irregular. The plane can only skim the ground in open flat country and over water. And even 20 yards of altitude requires a downward angle for the plane's guns for their fire to be of any effect.

In order for the fire to reach into even slight depressions, its downward angle must be 10 or 15 degrees. That angle would make most of a plane's fire strike the ground, thus decreasing the defilade of ground irregularities and increasing the number of bullets that strike a given area that is attacked. But the greater angle of fall makes the danger space created by each bullet much shorter. Compare this sketch with that (Figure 21 with Figure 22).

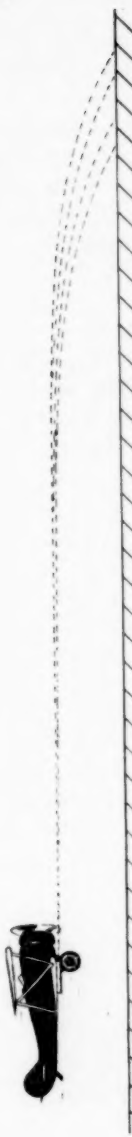

FIGURE 21

FIGURE 22

As a matter of fact, the danger space created by an angle of fall of 10 degrees is only a fraction of that made by one of, say, 2 degrees.

If *A* (Figure 23) is a man, in a sitting or kneeling position, he presents a target roughly a yard high, and if a bullet from an attacking plane just parts his hair, it will strike the ground at *B* with a 10 degree angle of fall, and at *C* with a 2 degree angle of fall. The danger space *AB* is 55 yards, and the danger space *AC* is 28.5 yards, or 5.2 times *AB*.

AIR.—That's all very well, Ground; but you must remember the tremedous quantity of fire that each plane puts down. The four guns firing forward (The other two, in rear, are usually used for defense against hostile pursuit ships.) fire at a rate of 1200 rounds a minute. Enough ammuntion is carried for 30 seconds' fire. So those four guns fire 2400 rounds in 30 seconds. That's a tremendous amount. It's hard to see how anything can pass through such a fire without being hit.

GROUND.—Honestly, Air, it's not quite that bad. It's perfectly true that an attack plane fires 2400 rounds in 30 seconds. During that time, however, the plane flies, at 200 miles an hour, a distance of 3000 yards, doesn't it? Now, if the guns are set so that their fire covers a strip of ground 20 yards wide for example, the area of the whole zone beaten by the 2400 bullets is 3000×20, or 60,000 square yards. But, as we saw a little while ago, the danger space created by each bullet with a 10-degree angle of fall is about 5.5 yards long.

AIR.—What about the richochet effect?

GROUND.—That's true; we should add something for that. The angle of ricochet would be considerably greater than the angle of fall, when that is only 10 degrees. Even very small irregularities of the ground make the rapidly rotating bullet bounce at all angles. My guess would be an average of about 30 degrees. That would add (Figure 24) 1.7 yards to the length of the danger space, making it 5.5 plus 1.7, or 7.2 yards long.

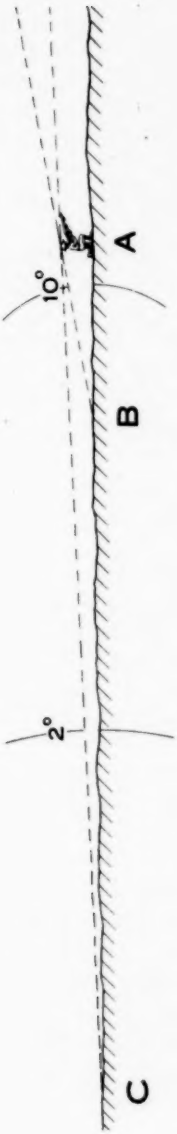

FIGURE 23

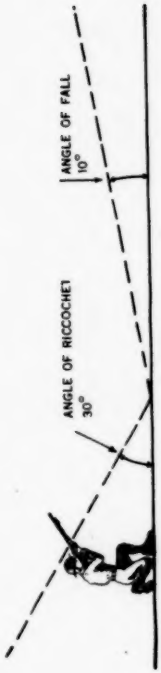

FIGURE 24

Now, the body of a man is 22 inches wide at the shoulders; but in the sitting or kneeling position the firer does not expose his full width. A series of measurements conducted not long ago showed the average width of a man's body in the sitting position to be about one foot, as seen from the direction of the target. A foot is 0.33 yard. Then 7.2×0.33 or 2.4 square yards, is the size of the danger area made by each of the 2,400 bullets

The total danger area created by all the bullets is 2.4×2400, or 5,760 square yards. Then 5,760 square yards of the 60,000 square yards in which the 2,400 bullets strike is danger area. The chance that a man within the beaten zone would be hit is 5,750/60,000 or 9.6 per cent, under the conditions we have assumed.

AIR.—Well isn't that enough to make 'em keep their heads down?

GROUND.—It's a heavy fire, there's no doubt of that. But so far we have been considering the ideal case. We have assumed, among other things, that all machine guns of the attack plane function perfectly. But both air and ground machine guns do jam with fair frequency—I should say about 25 per cent of the firing time. Also, when the guns of a plane jam, the pilot can do nothing about it except to operate a lever that pulls the bolt back. A stoppage that cannot be cleared in that way, remains a stoppage until the plane lands.

AIR.—That's true. But I think that 25 per cent is a high estimate. Good guns with picked ammunition function mighty well.

GROUND.—O. K. Let's say 10 percent then. That would reduce the casualty chance from 9.6 to 8.6 percent. Now, there are other factors, too, that should reduce the casualty percentage still more in the average case. For one thing all terrain except that which is free of trees and perfectly flat will offer some protection to ground troops. Irregularities of the ground, with a slope greater than the angle of fall of the plane's fire, give partial cover. A man in a trench or ditch can fire at a plane with most of his body

protected. Trees absorb a small amount of fire. It is impossible to make any estimate for what we might call "average" terrain; but surely average terrain is not perfectly flat and open.

Another thing that would reduce the casualty chance is the fact that the pilot of an attacking plane will seldom be able to fly so precisely that the fire of his guns will make a precise pattern on the ground that is 20, or any other given number of yards, in width. In other words, the plane will not always move on an even keel. It has only to rise a few degrees to scatter bullets way out of a narrow beaten zone.

AIR.—When the pilot takes a rising course, he'll probably stop firing momentarily.

GROUND.—In that case, then, the attack fire is distributed over a greater length than 3,000 yards.

AIR.—This analysis of an attack plane's machine-gun fire is very interesting; but it's the bombs that do the real damage. The machine-gun fire is, I'm quite ready to admit, nowhere near as effective as the bombs. It's a covering fire for the attack.

GROUND.—Bombs are bad medicine, all right. Do you think they are much worse than shells?

AIR.—They are worse in this way: an attack plane pilot can lay an egg much more accurately than an artilleryman can fire a shell. The artillery has a big dispersion.

GROUND.—Perhaps so. But here's the way it seems to me. A pilot moving 100 yards a second, only a few yards off the ground has mighty little time to choose his specific targets. He can only look ahead with difficult observation at best, select a general area with troops in it, and then lay an egg or two as close to the right moment as he can estimate. If the plane is 20 yards off the ground, it takes the bomb 2.2 seconds to hit the ground. (The parachute bomb is different.) The horizontal speed of the bomb is the speed of the plane. Hence, to strike a certain spot, the pilot must release the bomb 2.2 seconds (220 yards) before he reaches it. Actually, he must be

nearly 300 yards from his target, because it takes about half a second to complete the mental and muscular processes of selecting the target and pulling the bomb lever, and during that half second he moves 50 yards.

Another thing, bombs must have a delayed fuse; or else the plane dropping them receives hits from its own bomb. Even four or five seconds' time gives men a chance to get some little distance from the bomb, when they happen to be directly under the path of flight.

AIR.—Bombs throw their pieces a long way, though. And fragmentation bombs detonate on end so that the fragments skim out over the ground and close to it. The fragmentation bombs give excellent results in tests, especially the parachute bomb.

GROUND.—Very true. Testing a bomb on a field as flat as a pancake, under perfect conditions, gives certain results. But those results should be discounted considerably unless the conditions can be reproduced exactly in war. The one item, irregularities of the ground, will reduce casualties considerably. So does a soldier's helmet. And how much of a target do you think a man makes when he's hugging the ground? Lying on a smooth floor, the average thickness of his body from head to foot is only 6.5 inches. I have no doubt that the fragmentation of a high explosive shell is roughly equivalent to that of a bomb of the same weight. Yet many a soldier has hit the ground within 20 yards of a shell and remained unharmed. Even the calculated chance of a man's getting hit on absolutely flat ground does not prove the bomb to be so terrible.

A small fragmentation bomb weighs from 20 to 30 pounds and breaks into about 1500 pieces. When it goes off on contact with the earth those pieces fly for several hundred yards in all directions. Modern bombs of the parachute type land on end, at a reduced rate of fall due to the action of the parachute. Because of this, the bomb's fragments have a flat trajectory. Let us say that none of them rise higher than a yard at a distance of 50 yards from the point of detonation. In other words, if we built a circular fence, one yard high on a circle 100 yards in

diameter, and the bomb went off in the middle of the circle, all fragments, under our assumption, would hit either the fence or the ground inside of it. Let us say that half the fragments strike the ground, and the other half, the fence. (Figure 25.)

Considering first, the half that strike the fence: 750 fragments will be distributed upon an area of 2,826 square

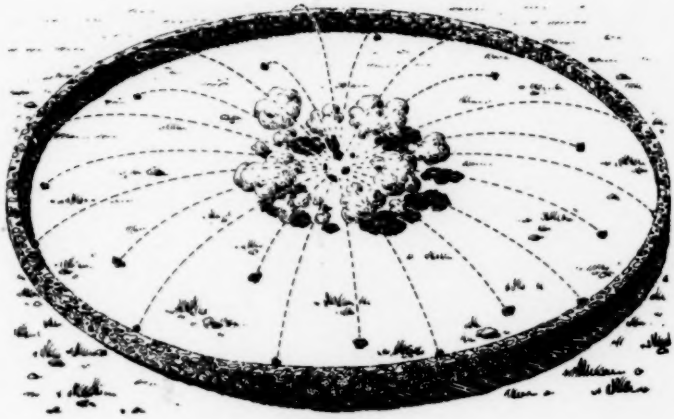

FIGURE 25

feet, which is the surface of the fence. Then there will be one hit for each 2,826/750 or, roughly 4.0 square feet of fence. Now suppose a soldier is hugging the ground at the fence, with his helmet toward the bomb in order to present the smallest possible target. The size of this target is a little less than one square foot. Hence, the soldier's chance of getting hit with one of the fragments that strike the fence is about 25 per cent.

Now, considering the 750 fragments that strike the ground inside the fence, let us assume that the average

angle of ricochet is, on flat ground, as low as 15 degrees. This would cause (Figure 26) all fragments striking between *C*, center of circle, and *B*, to bounce over the fence. Then only those fragments that strike between the fence *A*, and *B*, would strike the fence. The whole area inside the fence is 80,550 square feet. The strip *AB* (Figure 27) is 11.2 feet wide, and running all around the circle, has an area of 10,167 square feet. Then 10,167/80,550 (about

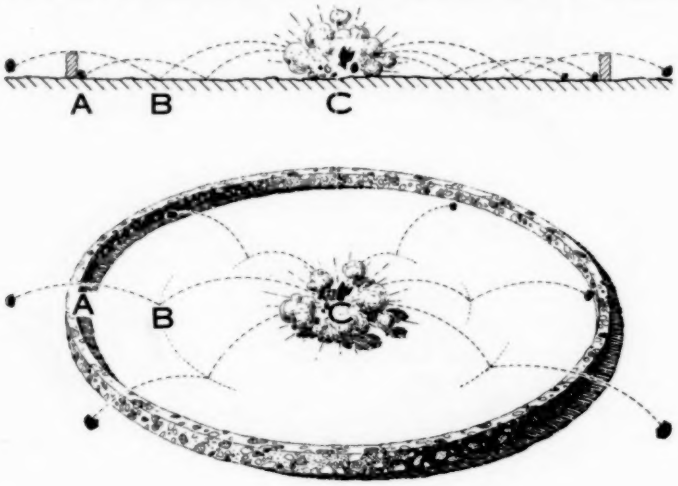

FIGURE 26

1/8) of the 750 fragments, or 94 fragments, will strike within the strip *AB* and ricochet hitting the fence. The chance that the soldier will be struck by one of these, figuring as before for the first 750, is about 4 per cent.

Thus, his whole risk is 25 plus 4 or 29 per cent, when he is 50 yards from the bomb, and prone.

This is by all odds a maximum for the conditions assumed, which were, again, flat open ground, and a perfect vertical landing for the bomb. If the bomb strikes at any angle from the vertical—the perfect landing is rare—a large percentage of fragments from one of its sides would

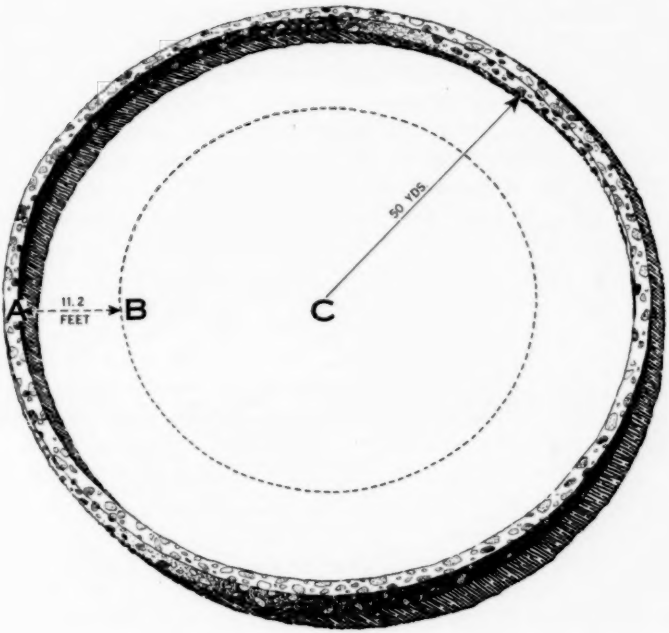

FIGURE 27

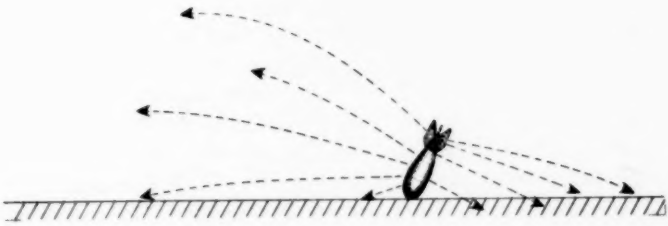

FIGURE 28

penetrate the earth close by; and on the other side, a large percentage would have a high trajectory, and would strike with little force and at a long range. (Figure 28.)

Then, too, even with a perfect vertical landing the bomb seldom holds all its fragments down to a height of 1 yard in 50. Again, our calculation takes no consideration of ground irregularities. If the area within the fence in Figure 26 contained several hundred men, and each man was lying in a fox hole a foot deep—as in bivouac, for example—there would be few casualties except very close to the point of detonation. (Figure 29.)

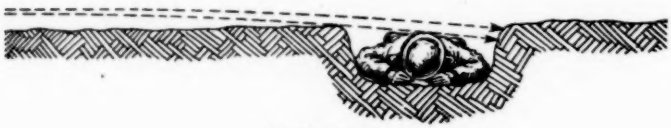

FIGURE 29

Considering bombs and bullets together, there is no question in my mind that serious casualties will sometimes result from the onslaught of attack planes. But, even so, these will be confined to a narrow strip over which the planes pass. As the planes approach, the covering fire of the forward guns will not seriously hamper the anti-aircraft fire of ground troops in its path. And after the bombs are dropped, the nature of the terrain surface more than anything else, will determine the percentage of casualties for a given distribution of troops.

AIR.—Have you ever given much thought to the effect of a low gas attack? It seems reasonable to believe that any enemy that might make war against us would eventually employ chemicals, even if not at first. At least we must be prepared.

GROUND.—Yes, I've thought plenty about it. There's no doubt in the world but that low-flying planes can sprinkle gas liberally on any area over which they pass.

AIR.—Do you think there's any answer to it?

GROUND.—Yes. There's the same answer to such an attack that there is to the aerial attack with bullets and bombs: the concentrated antiaircraft fire of every ground weapon including pistols—and even rocks, if the planes fly low enough.

AIR.—But what about the gas?

GROUND.—There's plenty of time to put on masks after the plane passes overhead. It takes several seconds for gas to drop 20 yards.

AIR.—But mustard burns right through clothing.

GROUND.—Very true. Mustard would certainly make it miserable for ground troops, even with their masks on. There are, however, a few alleviating points to the picture. I am going to give them to you one at a time and you can weigh them for what they're worth.

First: Mustard gas that touches the skin directly leaves no burn, or only a slight one, if washed off with soap and water, or even mud, inside of a half hour.

Second: The direction of a slight ground wind is difficult for a pilot flying 200 miles an hour to judge. The frequent errors in laying smoke prove this.

Third: The wind cannot blow two opposite ways at the same time. In some situations foot troops can move a short distance into the wind and avoid the gas. I wouldn't mention this point except for the fact that I have seen it done with a whole company, during a simulated gas attack. (Figure 30.)

Fourth: The lower the altitude of a gas-laying plane, the more inaccurate its work will be; the higher the altitude, up to 300 or 400 yards, the better the target the plane makes for troops over a wide area.

AIR.—What will foot troops do, if the gas attack is curtained by smoke?

GROUND.—In the first place, the smoke planes that precede the gas planes are just as vulnerable to ground fire as any other planes. Moreover, they give ground troops a splendid warning of the direction of attack. Finally, the smoke screen is not ordinarily very wide. Many men under it will be able to run out of it in time to take good

aim back along its top edge to pot the first gas plane. I've seen that done a number of times.

(GROUND laughs suddenly; and then resumes talking.) You know, Air, I must belong to the "old army", all right. We've been talking here for an hour without mentioning automatic weapons.

AIR.—We talked about the machine guns on the planes, didn't we?

GROUND.—That's right. I'd forgotten. But now we've covered the terrors of the air pretty well, let's consider those of the ground a little further. Or are you getting tired of all this shop talk?

AIR.—Not at all. If I remember right, I started it. And it's mighty interesting to hear an expert foot soldier expound once again.

GROUND.—Maybe if I keep it up strong enough, I'll have you transferring back to the doughboys again.

AIR.—Not a chance, I'm afraid. Anyway, it won't be long before planes will be running bullets a good race.

GROUND.—Well, if the plane and the bullet are going in opposite directions, and happen to meet, they'll bump even harder than they do now.

AIR.—O.K., pal. You always know the answers, don't you? Well what are you going to spout about next?

GROUND.—Let's talk about automatic rifles and antiaircraft machine-gun firing for awhile. You know as well as I do that we have automatic riflemen and machine gunners in considerable numbers. And in 5 seconds the automatic rifleman can fire 4 or 5 shots instead of the rifleman's 2 or 3; and the machine gunner, 25 or 30.

AIR.—I guess you're right about the automatic rifleman; but if your machine gunners can't do any better at a fast moving target than I can shooting a free gun from the rear cockpit, while passing by a target, I hardly believe they'll have much accuracy. It is almost the same firing a machine gun from the ground at a moving target, as it is to shoot at a stationary ground target from a moving plane.

FIGURE 30

GROUND.—Not quite. On the ground you don't have to wrestle the gun against a 200-mile-an-hour breeze.

AIR.—All right. That's a horse on me this time. But if I remember correctly, we found when we were working together in the Third Section that the machine gun had a big dispersion when fired from a single-point suspension, as it has to be fired at a plane. Has anything been done to correct that?

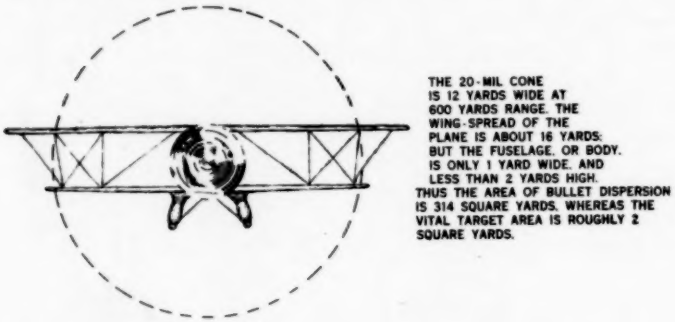
THE 20-MIL CONE IS 12 YARDS WIDE AT 600 YARDS RANGE. THE WING-SPREAD OF THE PLANE IS ABOUT 16 YARDS: BUT THE FUSELAGE, OR BODY, IS ONLY 1 YARD WIDE, AND LESS THAN 2 YARDS HIGH. THUS THE AREA OF BULLET DISPERSION IS 314 SQUARE YARDS, WHEREAS THE VITAL TARGET AREA IS ROUGHLY 2 SQUARE YARDS.

FIGURE 31.—Comparative size of attack plane and machine-gun antiaircraft cone at 600 yards range.

GROUND.—Well, yes. There's been some improvement due to better balancing of the gun during firing. But the vibration of the gun seems to defy most means of reducing it that still leave it free enough to be swung and fired at fast-moving aerial targets. Even with the improved mount, the dispersion is still so big that with perfect aim, the Law of Chance causes by far the greater number of machine-gun bullets to miss the target. Firings by both the French and ourselves indicate that the machine-gun antiaircraft cone of fire is about 20 mils in diameter (That figure will probably be improved on when dispersion tests are made from the new mount.) when the gunner holds the gun fairly steady. (Figure 31.) That means, in firing at an airplane approaching directly toward the gun, and with perfect aim, that 95 per cent of the fire is wasted

until the plane comes within 700 yards, 85 per cent until it's within 500 yards, and 65 per cent until it's within 300 yards. By that time the planes are only 3 seconds away.

AIR.—Yes; and by that time the gunner is full of holes.

GROUND.—Yes, as I showed you a while ago, he may get hit if he has hard luck. But please bear in mind, old scout, that a machine gunner just outside the beaten zone of

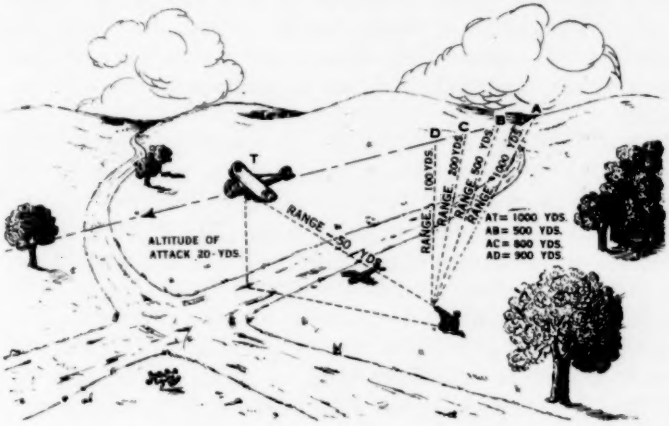

FIGURE 32

bullets and bomb fragments will run little or no chance of getting hit at all.

AIR.—True; but he has a much harder target to fire at. He has to swing his gun around pretty fast to keep up with the angular displacement of a 200-mile-an-hour target.

GROUND.—Only for the last second or two before the attack planes pass by. Look here. (Draws another sketch as in Figure 32.)

The arrows shows the attack direction, and *G* is a machine gun at a short distance to the left of it—say 50 yards. My sketch is roughly to scale. Now if *G* begins

firing at *A*, in 5 seconds time he has to swing his gun to the left to *B*. You can see that the angle through which the gun swings is very small. Even after firing for eight seconds and swinging to *C*, the whole angle of swing from *A* to *C* is less than 20 degrees. It's only about 30° from *A* to *D*, where the plane is only 100 yards away. It's only during the last second or so before the planes pass by the gun that the gunner has to scramble in trying to keep his fire somewhere near the target. If he's 200 or 300 yards from the plane as it passes, instead of 50 yards, he can follow a 200-mile-an-hour plane right up to its minimum slant range, and follow on as it gains distance on him again.

AIR.—That may all be true if your enemy pilot is obliging enough to fly in a straight line. But he's not going to; he'll come in on a curve from almost any direction.

GROUND.—That point is well taken. But I think it has at least one answer and probably two. In the first place, it seems to me that a pilot moving 200 miles an hour will have to straighten out for several seconds at least before attacking any given area however small. There's not much gained in attacking even as small a target as a bridge, for example, unless he sweeps it from end to end with fire and bombs, and takes in both approaches to it for good measure. And besides that, the antiaircraft defense of anything will have more than one gun. Let me draw another picture (Figure 33.)

Let's say that *A* is an area 200 yards square occupied by something worth attacking by enemy planes. The eight *G*'s are machine guns. The four nearest to *A* are 500 yards out and the four others, 1000 yards. Now in order to reach *A* the planes may curve in toward it from any direction, yet several guns will pick them up and open fire. The sketch is only diagrammatic of course. But do you see what I'm trying to bring out? The planes are not liable to put out more than one gun—or two, at most—from any direction of approach; and there will always be other guns, not in the planes' line of fire, to fire at them. The

planes may not see any of the defense guns at all, approaching as low and as fast as they do.

AIR.—Eight guns wouldn't form much of a defense, would it?

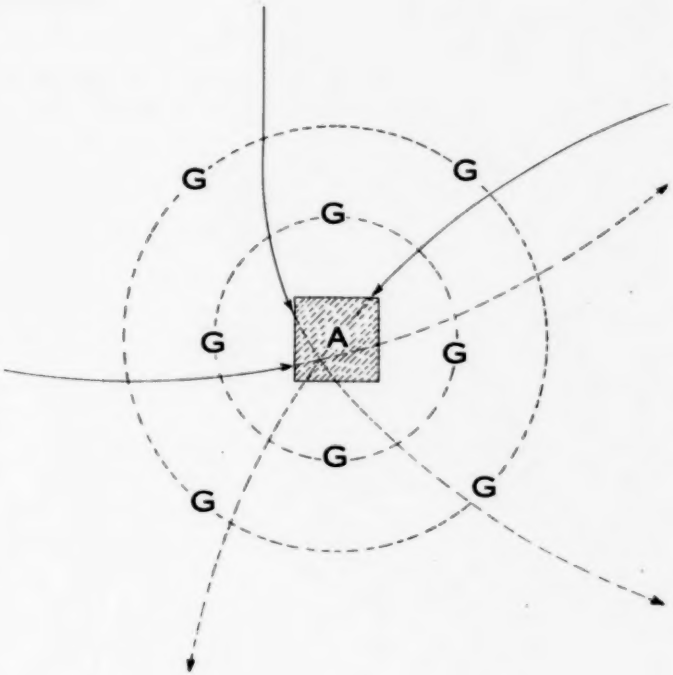

FIGURE 33

GROUND.—That depends on what you're defending. My sketch with eight guns is only illustrative. A strong ring of defense would take a good many more. A double ring of defenses like this (Draws Figure 34.), with guns every 200 yards on both circles, would take 31 guns on the inner, and 62 on the outer, circle.

It would be much better to double the inner circle. That would make a total of 124 guns.

AIR.—Isn't that a lot of guns?

GROUND.—Not so many. There are now 72 in an infantry regiment. The three machine-gun companies each have

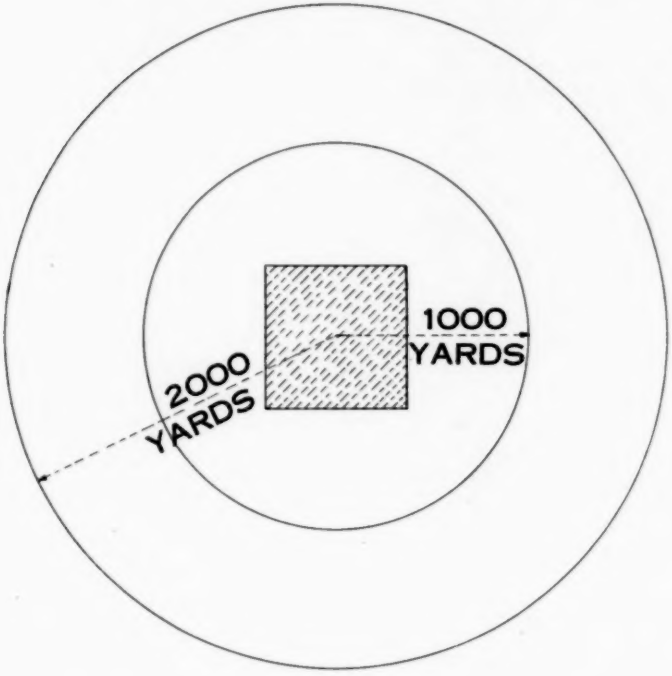

FIGURE 34

12, and every rifle company, 4. The area inside the smaller circle contains a little over a square mile—plenty of room for several regiments without crowding. In other words, Figure 34 might represent the defense of a brigade bivouac area. So there would be ample guns available. It is true that we do not teach the use of a double ring of

guns at present—only a single circle of infantry machine guns in such a defense. But you see how the double ring is quite possible. And don't forget that there are also machine guns in the engineers and field artillery of the infantry division. And besides all organic guns, there will

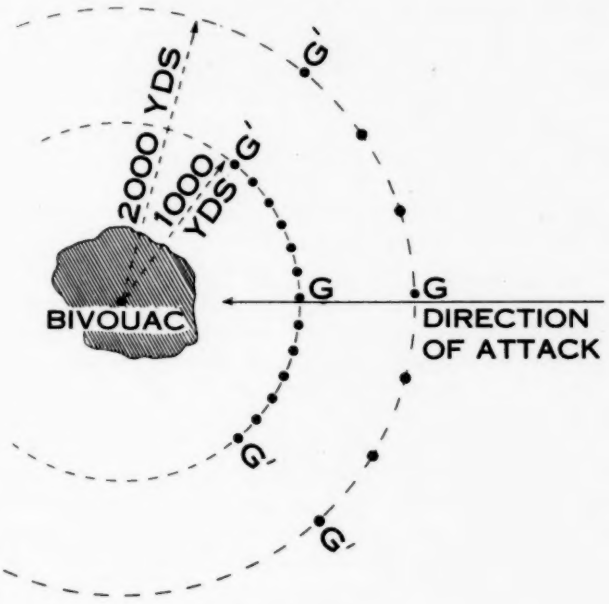

FIGURE 35

often be attached units of specially trained antiaircraft artillery, including machine-gun units.

AIR.—Well, suppose for example that three planes came over to attack the bivouac, how many of the 126 guns would fire at them? More planes than that would attack, if the bivouac were big enough to be worth attacking. But say three planes for the sake of argument.

GROUND.—We'll have to draw an enlarged sector of part of the defensive circles. (Figure 35.)

The guns will be placed on the best ground available, of course; not necessarily regularly as I have placed the dots in the figure. If we assume that all guns within 600 yards of the path of the planes fire at them, then 7 guns, 200 yards apart on the outer circle, and 13 guns, 100 yards apart on the inner circle, will be the total that will fire.

Now, let's get some idea of the quantity of fire, too. We can assume with reason that the average length of firing time for all guns is at least 6 seconds. They open at about 1000 yards range. It may be too dangerous for friendly troops for the guns to fire after the planes cross the defense lines. By all odds, they can't fire back toward the bivouac against very low-flying planes. However, safety measures preventing the firing of the guns below a certain angle, when they are aimed back toward the bivouac, should take care of this. Except in a hasty defense, they would have protection from each other's fire. But if they only fire until the planes cross their circle, the guns at *G* could fire at them for 10 seconds; whereas the guns at *G'* could only fire for 3 or 4. It should average up something over 6 seconds. In 6 seconds a machine gun fires 60 rounds. There are 20 guns that can fire; so 1200 rounds welcome the visit of the three planes to the bivouacs. If they're not hit on a vital spot coming in, another 1200 will speed them on their parting way on the other side, when they go out.

AIR.—Your guns have jams too, don't they?

GROUND.—Yes, I think 25 per cent is a fair amount to knock off for jams. From 2,400 rounds—1,200 coming, and 1,200 going—that would leave 1,800.

Then don't forget that somebody in the bivouac may grab his rifle and fire a shot at the planes, too. Rifle fire at planes is more accurate than machine gun fire. But let's let that go for the moment. The 1,800 rounds would be 600 apiece for the 3 planes.

AIR.—Not all hits, I hope.

GROUND.—No, hardly all of them.

AIR.—What *is* your *real* belief as to the effectiveness of that fire?

GROUND.—I'll have to go into a little detail to tell you. The gunners at *G* on both circles and on both sides of the bivouacs should make about 6 per cent hits of shots fired. The gunners next above and below should make 2 per cent, and all the others, approximately 1 per cent. I think I'm being fair in those estimates. I am assuming one-third or less of what we make under peacetime target range conditions, firing at towed targets. But the front half of an attack plane fuselage, which contains all the vital spots, is roughly twice as big in both side and front area as the towed target. Thus, after dividing by 3, we must double the percentages of hits, in order to estimate what they would be on planes in war. Then, summing up, we would have, with all 40 guns (20 on each side of the bivouac) firing 60 rounds at the planes—

6 per cent of the fire of the guns at *G* on both circles and on both sides of the bivouac (4 guns, firing a total of 240 rounds)	14.4 hits
2 per cent of the fire of the guns next above and below *G* (8 guns, firing 480 rounds)	9.6 hits
1 per cent of the fire of all other guns (28 guns, firing 1680 rounds	16.8 hits
Total	40.8 hits
25 per cent off for jams	10.2
Balance	30.6 hits

The planes would average 10 vital area hits apiece. The truly vital spots—cylinder walls, controls, gas lines, wiring, etc. and the pilot—constitute more than one-tenth of the area of the front half of the plane's body. So I should say there was a very small chance of any one of three planes' passing over our assumed defenses without being forced to land by the machine-gun fire alone.

The rifle and automatic rifle fire might be considerable, too. Say there was a brigade in the bivouac; and that even one rifleman out of 10 gets in a single shot. That

would make 374 more rounds fired. If one automatic rifleman out of 10 fired 3 shots at the attackers, that would make 98 more rounds, or a total additional of 472. Assuming an average of 2 per cent hits out of shots fired, the hits from the additional fire would be 9, or 3 per plane.

All these figures I've given are, of course, just a way of indicating what will happen under the assumed conditions. You've noticed, I hope, that I've leaned over backwards to be moderate in my assumptions. Actually, there's little doubt in my mind but that three planes coming in over those defenses would usually get a hotter reception than I've indicated.

AIR.—Well, it looks as if you might put a few holes in the planes, all right. But what damage will a .30 caliber bullet actually do to a plane. I'll agree, certainly, that if you kill the pilot when he's flying 20 feet off the ground at 200 miles an hour, something serious is liable to happen. But what if you do hit the engine, do you think that would stop it entirely?

GROUND.—There are all degrees of possible damage, of course. Hitting the cylinder wall will probably stop the engine dead within a few seconds. If you want to try an experiment, start the engine of your car, and then hit the side of the cylinders a good hard blow with a sledge hammer and see what happens. The energy of a bullet striking the cylinders is roughly 20 times that of a full swing with a 10 lb. sledge hammer. Besides, the airplane engine is a much more delicate and fragile piece of mechanism than that of a car. The outside is covered with about 0.2 of an inch of duralumin. That stuff resembles cheese as far as stopping a bullet is concerned. Then, inside of that are the cylinder walls. Do you know how thick they are? Just ⅛ of an inch. And when the bullet goes through, it doesn't make a nice, round little hole. The steel is too brittle. The bullet usually cracks out a good-sized piece or two. Some of it falls inside the cylinder if the piston happens to be below the bullet strike; and when the piston comes up, it hits the piece of wall, jams

up against it, and the rod breaks. If the bullet goes into the piston as well as through the wall, the piston may break, too. At least you have enough distortion to gum things up so that the piston seizes. You know better than I do that the airplane motor is a delicately balanced mechanical unit and far from being rugged. You may be able to limp home after getting a bullet in the engine, but your chances are not at all good. Your engine won't stand much "shooting about", as the British flyers used to say during the war.

There were several hundred airplanes shot down by rifle and machine-gun bullets from the ground during the World War. But for every one of those there were many that had to land, or that fell in flames, because of bullets in the engine. One of Richtofen's famous squadron lost eight successive planes from bullets in the engine. They nicknamed him the "Bullet Catcher". He was lucky enough to be high in the air when the enemy flyers shot his engines, and, every time, was able to glide into friendly territory when he was not already over it. Now those World War engines were several times as thick, and heavy, and rugged for their size as the modern engine. They could stand a lot more "shooting about". Then, too, if the "Bullet Catcher" had been 20 feet off the ground over hostile territory when he lost his first plane—instead of several thousand feet up and within gliding distance, at least, of his own lines—he would have had a forced landing in enemy territory, and would never have earned his nickname.

Here's another point. The most exposed thing about a plane is the propeller.

AIR.—Wait a minute! Propellers are made of metal these days. You can shoot them full of holes and they won't break. The old wooden prop was ruined when a bullet hit it; but not so with the modern propeller.

GROUND.—True enough; I really knew that. But here's what I'm getting at. Right now, in peace time, when your synchronized guns get out of whack, and you acci-

dentally put two or three bullets through your propeller, what do you do? You throttle down as low as you can and get home in a hurry, don't you? Now, why is that? Because the holes in your propeller throw it out of balance, and it's very easy to damage your engine with an out-of-balance prop. But those accidental holes are well down the blade of your propeller. Suppose, instead, that a hostile rifle bullet happened to go through the tip. That single bullet hole out there at the tip would throw the propeller so badly out of balance that it would literally tear the engine out of the plane if you didn't cut down your speed at once. It sets up a tremendous vibration. And with a propeller in that condition there is a good chance of never getting back to the home airdrome at all.

AIR.—Light armor, like that of a steel helmet, placed around the engine ought to deflect most of the bullets from the ground. A shot that struck perpendicular to the armor would go through; but most of those that struck at an angle would be deflected.

GROUND.—It would give some protection but not much. An ordinary .30 caliber bullet will go through several helmets. Besides, it is doubtful whether any weight at all can be spared—in the present designs of attack planes at least—for such armor. Enough light armor, 1/8 of an inch thick, to cover the two sides, bottom, and front of the engine, would weigh about 300 lbs. What part of the present attack plane load can be sacrificed for that additional weight? Not gasoline, nor armament. It seems possible, however, to design a plane in such a way as to incorporate that extra weight and all the other necessary loads, too.

However, it is also probable that the increased penetrating power of new types of small arms ammunition would more than offset the inclusion of a light armor before long. But we haven't got that ammunition yet; and the air forces of the world don't have armored planes—as of today, anyway.

If the armored plane ever proves a success—it has never been a success so far—, it would simply drive

ground troops to the use of such weapons as the .50 caliber machine gun. One hit by a .50 caliber bullet, and your engine would certainly stop, light armor or not. That bullet will rip completely through a 12-cylinder engine from front to rear, if it happens to hit that way.

AIR.—Yes, there's no question about that being a bad one.

GROUND.—Before we leave this subject of damage to the plane from bullets, I have one or two more happy thoughts to leave with you.

AIR.—Don't tell me you're going to reach up with a sky hook and twist off the plane's tail?

GROUND.—No. Better than that. The .30 caliber bullet, armor piercing, will detonate a small bomb such as attack planes carry underneath to drop on troops. It seems to me that, if anything is armored, the first thing should be the bomb load. I would certainly hate to be sitting over 10 or 15 of them while boldly rushing through any quantity of bullet-filled air. The detonation is not full force, however. It's what the Ordnance call a "low order" detonation—but big enough to break up the bomb in several chunks and throw them 10 or 20 yards. If it didn't wreck the plane, it would probably jam the bomb-release mechanism or else jar most of them loose. Just what increased effect the high-velocity bullet of the near future will have is hard to tell. I doubt, however, if the detonation would be any lighter if the bomb were hit much harder than now, as would be the case.

AIR.—It seems as if some protection along that line might be in order.

GROUND.—Now, the last thing I have in mind to tell you, regarding new antiaircraft possibilities is the semi-automatic. We've been working on that type of rifle for a long time, of course; and its eventual adoption not only by our army but by every other, seems to be a foregone conclusion. Its use against low-flying airplanes would considerably increase the quantity of lead they would have to fly through during an attack. If hostile attack planes happened to attack an area containing an infantry bat-

talion, and every man fired his own weapon for five seconds, a battalion as now armed would fire—

544 rifles (2 shots each)	1,088 rounds
12 machine guns of the MG Co. (50 shots each)	600 rounds
54 automatic rifles (5 shots each)	270 rounds
Total	1,958 rounds

Now, the adoption of the semi-automatic rifle would enable each rifleman to fire 5 hasty shots in 5 seconds, thus increasing the total rounds of rifle fire to 2,720 rounds, and the total from all weapons to 3,590 from 1,958—an increase of 83 per cent. These figures are maximum, of course, assuming as I have that every man fires every second of the time. But they serve to bring out the comparison. The semi-automatic rifle would practically double the amount of antiaircraft fire from ground troops.

AIR.—Ground, old fellow, you've told me a lot of things this afternoon that I haven't been clear on before. Even if I knock off some for all that infantry enthusiasm of yours, I can see that attack units are going to lose planes from ground fire. But that won't stop them from attacking, if the game is worth the candle.

GROUND.—Of course it won't, Air. There are likely to be situations in which the loss of planes may well be worth the damage accomplished.

But in my opinion, the percentage of plane losses in attack units will be so great that their employment as such will have to be limited to only the most important of objectives. The same thing will happen that happened in 1918. During the first half of that year the losses to planes from ground fire became so great that the British, German, French, and American armies were compelled to restrict low-flight missions. The planes were needed for other work too badly.

AIR.—Well, even after all you've said, you can't deny that attack aviation can shoot the devil out of ground troops?

GROUND.—No, I can't. But ground troops can certainly shoot the devil out of attack planes while they're doing it!

CHAPTER VII

Foreign Thought on the Low-flying Attack

INTRODUCTION

Without exception, the greater armies of the world today take cognizance of the air attack from low altitudes against ground troops. There are differences of opinion as to its value, of course, and as to the way in which this attack should be met by infantry and the other arms. But the subject is present in all armies as a well-defined part of their military thought. The United States, however, is the only nation whose Air Corps has developed a specific type of plane for the ground attack. In the other armies the attacking of troops from the air is made the work of either pursuit planes, or light bombers.

BRITISH PRACTICE

The British, for example, use their "fighting", or combat, planes for this purpose. In the British Field Service Regulations we find that "fighting squadrons may also be employed in carrying out low flying attacks on enemy troops, transport, and aerodromes, when the air situation permits". This last clause indicates that the ground attack is considered a secondary mission. Quoting further: "The offensive capabilities of aeroplanes against ground targets enable them to be employed effectively to attack the enemy's troops whether on the battlefield, on the march, or in quarters, to raid his communications and his military establishments. They are of particular value in pursuit of a beaten enemy and may turn retreat into a rout. On the other hand, if used in large numbers, they may delay a pursuit, and thereby give a retiring force

time to disengage or reform. The moral effect of these means of attack is great, in addition to any material damage inflicted."

These general statements are further elaborated in the chapters of the Field Service Regulations dealing with the different tactical movements. In the " 'encounter attack' (meeting engagement), offensive action (from the air) by bombs and machine-gun fire against the enemy troops" may be employed. As for the pursuit: "Intensive attacks with the same weapons render invaluable service". In the "deliberate attack", the tasks of the air force are held to be the same as in the meeting engagement; " but as more detailed information will be available . . . . as to the enemy's dispositions, definite programs of work in cooperation with the artillery and for bombing attacks on the enemy, and particularly his lines of communication and rearward installations, can be made out before the attack commences". Again, in retirements: "All available aircraft should be employed on bombing the roads along which the enemy is advancing and preventing the enemy's aircraft from harassing the retreating troops".

In warfare in undeveloped and semi-civilized countries, British planes are to be used against flocks, supplies, villages, and crops. "Against such objectives the moral and material effects of a vigorous and sustained air offensive, provided sufficient flying units are available, may render further military operations unnecessary. The effect of purely air action is most difficult to gauge and even if successful is liable to be transitory. Such action, therefore, will usually have to be followed up by an advance of ground troops, especially in cases where a permanent effect is essential to the plan of campaign."

OTHER BRITISH OPINION

Individual opinion strongly supports the official teaching. In The Basic Principles of Air Warfare, by Squadron Leader, the author refers at length to the successful use of the air weapon against the Turks in Palestine during 1918. Both Allenby in Palestine and Haig in

France commented enthusiastically on the work of the Air Force in this respect. Squadron Leader says that in future wars it will be an important secondary duty of the air units to support the attacks of their own army by directing a low-flying assault against the enemy. Major General Sir F. H. Sykes, formerly Chief of Air Staff, expresses a similar opinion in Aviation In Peace and War.

Another thorough student of modern warfare who frequently touches upon the use of the airplane against infantry, is Major General J. F. C. Fuller, a leading British authority on mechanized warfare. In his work On Future Warfare, published in 1928, General Fuller says: "It is more than likely that twenty low-flying aeroplanes, mounting several machine guns apiece, could destroy an entire infantry division in column of march. But why fly low when gas as a weapon will enable air-craft to fly high and so incapacitate without killing. Twenty airplanes fitted with tanks of liquid gas could pour into the air a rain of gas which, as it descended, would atomize and form a great cloud which would roll over the scattered and unseen target below and throw an army into a 'mystic sleep' . . . . Traditional infantry, the greatest slaughterers of all, have no place on the future battlefield, not because they are harmless, but because they are absurd." We may well believe that General Fuller is looking some distance into the future in this well-nigh romantic passage, especially in view of what he writes in later volumes.

In the same book, however, there is this excerpt, not quite so unfavorable to infantry as we now know it: ". . . . . armies as constituted today are so slow, so ponderous, so dependent on their communications, and so complicated, that on the line of march they undoubtedly offer excellent targets to air attack. Nevertheless, antiaircraft defense is progressing, and the time may come when to attack an important railhead or supply center will be as dangerous as a ship's attacking a costal fortress."

Writing three years later in Lectures On F. S. R. II, General Fuller says: "Antiaircraft defense, which

is steadily growing in power, may be divided into three categories:

(a) Attack in the air by aircraft;

(b) Attack from the ground by gun fire, or machine-gun fire, assisted at night by searchlights;

(c) Attack on the enemy's ground organization (air-domes, etc.) by tanks, armoured cars, and armed motor cars."

Probably quite inadvertently General Fuller makes two important omissions. Under (b) he has omitted the rifle and semi-automatic rifle fire of troops—both of which many other writers leave out of consideration, it is true. And under (c), he has omitted the attack on air-dromes by airplanes from the air. This, indeed, might well form another main heading, because the destruction, by air bombardment, of airdromes, landing fields, and air maintenance units, is a primary mission of an air force.

It is also General Fuller's opinion, expressed in the same book, that it is not feasible for antiaircraft guns to move with the marching column, but that they must progress by leaps and bounds from one flank position to another. Under the heading "Protection From Aircraft" he writes: "Troops must always, whether at rest or on the march, be ready to protect themselves against air attack. Infantry should not solely depend on antiair-craft artillery but must be prepared at any moment to use their own arms". He goes on to recommend a lighter machine gun than the present British types, and the use of air sentries. Then he says, showing a considerable change of viewpoint since 1928: "Generally speaking, they (infantry) are unlikely to encounter the low-flying attack except on bridges and in defiles."

General Fuller's latest book, Lectures On F. S. R. III, adds little on the subject to his earlier discussions out-lined above, except that he thoroughly stresses the ad-vantages of mechanized units in withstanding attack avia-tion. He thinks that infantry, because of its vulnerability from the air, must give way to mechanized units. He also writes in this regard, however: " . . . . to hit a column of infantry is by no means an easy thing to do

. . . . if hitting is looked upon as striking the men in the column. But the men have nerves and are 'hit' every time aircraft are signalled; for a mere threat to attack will at once cause a marching column to assume a protective, and consequently static, order. This striking at mobility is a far more effective means of hitting than attempting to destroy a few lives, because, if persistently carried out, it must result in an ever-accellerating demoralization of personnel and disorganization of plan.

"In comparison with an infantry column, a mechanized column is far less vulnerable; not only will it generally offer a smaller and more dispersed target, but a threat to hit will not necessarily, or normally, be followed by a halt. To damage it, it must be actually struck; and, if one machine is hit, it is unlikely that any other machine will suffer. From this we see that one answer to air power is armour; and indirectly, armour on land has a more detrimental influence on air tactics than fire. A bullet, or a shell, may bring a single airplane down, but armour 'strikes' at air power itself by denying moral effect to inaccurate bombing."

TEACHINGS ON COUNTER MEASURES

In the British official regulations we find considerable thought given to counter measures against aerial attack. In the Manual of Antiaircraft Defense (Ground Units), which is almost entirely an antiaircraft artillery text, we find the principal means of active defense listed: "Machine guns on aeroplanes, antiaircraft guns on the ground, small arms on the ground, searchlights, and sound locators". Further references show the method of using small arms by "detaching machine guns and Lewis gun sections from units in close proximity to each other and placing them under a machine-gun officer for the area occupied by the unit concerned". This manual contains no reference to the use of the rifle or semi-automatic rifle against attacking planes.

On the other hand the Small Arms Training Manual teaches:

Small arms fire from the ground has a considerable disturbing effect upon the occupants of an aeroplane. A pilot usually tries to avoid flying over an area in which a large volume of small arms fire is directed at him.

Vulnerability of aeroplanes. The fact that an aeroplane does not at once crash to the ground when fired at is apt wrongly to discourage the firer. This need not be the case, for the ultimate effect of any shooting is often very considerable.

The vulnerable part of an aeroplane is very small compared with its total surface. A machine flying at 500 feet, at an angle of five degrees to a flank, presents a target approximately of 460 square feet. Of this surface, 106 square feet is sufficiently vulnerable, if struck, to place the machine out of action for from 12 to 24 hours. The total surface which, if struck, would render the aeroplane unserviceable for from 24 to 36 hours is about 20 square feet; while the total surface which, if struck would bring the machine down at once, is only 2.5 square feet, or about 1/200 of the target.

If aeroplanes that are out of range are fired at the only result will be a waste of ammunition.

By day, it may be taken as a general rule that a machine is within range so long as the struts or national markings are clearly visible to the naked eye. At 3000 feet, the side view of the struts and national markings are usually visible to the naked eye. At 500 feet, such small objects as cross wires, machine guns, and identification marks are visible, and the features of the pilot and observer may be distinguished.

By night, fire should be opened only (a) when the struts can be seen, owing to the aeroplane's being in the beam of a searchlight, (b) when it can be seen without the aid of a searchlight, silhouetted against the sky.

Part II of the Small Arms Training Manual (1931) devotes nearly sixty pages to infantry antiaircraft training. Extensive courses of instruction are given for both rifleman and machine gunner.

Further information and instruction is contained in paragraph 65, Field Service Regulations, as follows:

Although only five percent of the surface of an aero-

plane is vital to small arms fire, yet hits on a larger proportion will necessitate repairs at the airdrome and keep the aeroplane out of action for varying periods. Consequently the moral and material effect of small arms fire against aircraft, flying at altitudes not exceeding 3,000 feet, is much greater than is apparent from the ground, and limits the information which the hostile observer can obtain. Fire should therefore be opened against all low-flying, hostile aircraft, except in cases where it is essential to conceal from the enemy that a certain position or locality is occupied, and the troops are so well hidden as to escape detection unless they open fire.

Indiscriminate fire against hostile aircraft is, however, very undesirable. Fire should therefore be carefully controlled.

FRENCH THOUGHT ON THE SUBJECT

The French used the airplane in organized attack against ground forces during the World War, especially during the spring and summer of 1918. They also employed numbers of planes in direct attacks against the Riffian forces in 1925. In spite of this past history, there is still much discussion in the French army as to the value of the low-flying attack; and, in general, the French regulations for pursuit aviation envisage the low attack against troops as the exceptional.

Not long after the close of the war General Buat asked for a complete study of battle aviation and the creation of a new section of the air force for this work. Up to the present, however, it remains a function of the pursuit units, as in the British air force.

Colonel Guillemeny, editor of the French magazine of aviation, L'Aeronautique, comes to reasonable conclusions in an article entitled "Attack on Ground Troops By Airplanes in Grazing Flight", which he contributed to La Revue d'Infanterie of December, 1931. "It seems evident then," he writes after discussing European thought on the subject, "that only in certain circumstances, especially against demoralized or poorly trained troops, this method of attack can find its use. For this reason we should train our pilots in grazing flight, which presents certain

difficulties of orientation inherent in flight close to the ground.

"Whatever else may be said, there is the further aspect of the question: ground troops must be prepared to expect attacks of this kind—a hard proof for the morale of soldiers with little war experience. In time of peace, we should seek and apply the necessary counteracting measures."

The French antiaircraft measures against the low air attack comprise largely a machine-gun defense. Improvements have recently been effected upon former slow machine-gun methods of going into action. Experiments with a new machine-gun cart, designed to permit the rapid engagement of aerial targets, have cut the time down greatly. Specially trained antiaircraft units, moving by leaps and bounds to protect a march column, are favored rather than a general antiaircraft defense.

Commandant Loustaunau-Lacau, of the editorial staff of La Revue d'Infanterie, wrote in that magazine for March, 1933: "For antiaircraft protection to become habitual . . . . each column should be preceded and escorted by elements charged with giving the alert when necessary, and consequently, placed ahead and to the flanks at sufficient distances. These elements of protection are needed not only for giving the alert but also for avoiding retardations which incessant deployments and unnecessary halts, caused by false alarms, will inflict upon the column. A rigorous system of alerts ought to keep down the burden of antiaircraft protection.

"And it must indeed be admitted that motor transportation, by reducing the time of march to one-fifth that of foot troops, constitutes the most efficacious response to aerial attack."

GERMAN IDEAS ON THE SUBJECT

The German post-war training regulations call for the use of attack planes: " . . . . When the enemy is occupying easily recognizable features of the ground, air-

craft should be sent in simultaneously with the infantry assault, against a point where it is important that the enemy's resistance should be broken quickly." Also, "In the defense, when the preparatory positions of the enemy's infantry can be located, a determined attack by battle squadrons kept at hand for this purpose may break the weight of hostile attack or deploy it; their objectives, however, will usually be further back—hostile reserves, groups of batteries, reinforcements, etc." These extracts show that considerable importance is given to the aerial attack by German military authorities.

Antiaircraft measures have also received a good deal of thought in the German army. Among developments since the war is a machine-gun sight for antiaircraft firing, based on a similar principle to that of our front area sight.

The Militär Wochenblätt for December 25, 1932, contains a discussion of the aerial protection of march columns, written by General Müller. This writer opens his paper by saying that future regulations must take cognizance of this problem. He debates whether to leave the initiative in infantry antiaircraft protection to the chief of each echelon, or whether to increase the already ponderous operations orders by including prescribed directions. The protective measures seem to be largely a question of marching with increased distances between units, rather than active measures of firing at enemy planes.

The antiaircraft protection of a march column is touched upon in an article by Lieutenant Pickert in the Artillerische Rundschau, of February, 1931. The author considers the problem to be one of the outstanding tactical problems of today. He, too, suggests the breaking up of long columns into short ones, and leaves out of consideration the probable effect of the trained antiaircraft fire of ground troops.

The latest teaching of the German army, however, embraces active measures on the part of the ground troops. Articles in Kriegskunst for June, 1931, and April, 1932, and still more recently, emphasize the need infantry has for an antiaircraft guard, for methods of rapid dis-

persion, and for concentrated ground fire against the attack. The light machine gun is looked upon as the best weapon for this work, although all weapons are fired. These articles also touch upon the need for continued antiaircraft vigilance during halts and bivouacs.

OPINION OF THE BELGIAN ANTIAIRCRAFT DEFENSE COMMANDER

The August issue (1933) of the Bulletin Belge des Sciences Militaires, contains an interesting article by Lieutenant General Van de Putte, Commanding General of the Belgian Antiaircraft Defences, entitled "Some Thoughts on the Active Defense Against Low Flying Airplanes". This magazine, one of the most inclusive of the European military periodicals, has shown much interest in the subject and has published, among other articles, full translations of three articles on infantry antiaircraft that originally appeared in The Infantry Journal.

General Van de Putte writes that military opinion in Belgium is generally in favor of employing small arms against low-flying planes. He further states, however, that studies are being made to ascertain whether it would not be more desirable to use specially trained groups for antiaircraft defense. He believes that it is hardly possible to get satisfactory results without weapons especially designed to shoot down airplanes.

SOVIET OPINIONS

In 1929, there appeared a paper on the subject of attack aviation in the Russian magazine Technica Rozduscnovo Flota, the author of which is a member of the Soviet air force, Aviation Officer Turgianski. In this article he discusses the methods of executing the low-flying attack against march columns. It is his belief that the low-flying attack will be so much of a surprise that infantry will be unable to cope with it.

Not so sure of the effectiveness of aerial attack is the

anonymous author of an article in the Courier Of The Soviet Air Fleet for October, 1928. In a manner similar to that employed by the authors of the leading article of The Infantry Journal for May, 1930, the Soviet writer analyses the distribution of the aerial attack fire. In brief, he shows that a plane, flying 120 miles an hour close to the ground, can deliver fire upon a column 400 meters long for only nine or ten seconds.

ITALIAN COMMENT

In La Rivista Aeronautica, of October, 1927, Lieutenant-Colonel Mecozzi of the Italian Air Corps expresses his convinced opinion of the importance of low, grazing flight. Attacks of this type were tried out at the aerial maneuvers held at Frioul during that year, and have been accepted as an important function of the aerial arm since then. Other articles by Zeca, Cavino, and Maugeri, in the same magazine (March and April, 1929), recommend the use of systematic attacks on front line troops and against objectives behind the lines. These writers also touch upon the low-flight attacks with torpedo bombs against naval vessels, which were tried out in the 1929 naval maneuvers of the Italian fleet. These produced much enthusiasm because of their success.

A writer, using a pen name, contributed an article on "Assault By Grazing Flight" to Le Vie dell'Aria of August 16, 1931, which approached the subject from a logical viewpoint. The writer tries to determine whether the aerial attack is a mission of one of the present subdivisions of the air force, or whether separate attack units should be organized as in the United States. His picture of attack aviation is very dramatic. He says:

> Attack aviation, with its assault in grazing flight, is, then, the arm of rapid incursion; it kills, throws into confusion, burns, and—above all—destroys enemy morale, civilian or military . . . . . Against communications by rail, by road, and on rivers, the low-flying attack strikes the train on its tracks, the truck column on its route, and small boats on their waterways. It will

roughly handle small stations where troops, supplies, and food may be dumped or awaiting further shipment . . . . . With single planes it will attack every house where headquarters of large units may be installed. It will assail troops in bivouac in redoubts that appear to be safe . . . . . .

In the colorful ending of his article, however, the unknown Italian writer, bringing out the possibility of aerial casualties, strikes a chord of somewhat greater accuracy:

Attack aviation thus operating at low altitudes—in the midst of weather vicissitudes, in the eddies, in the fog, among propellor snares; swooping down from mountainsides, over wooded plains, over large bodies of water; passing among the cables of observation balloons and under the fire of enemy pursuers, ground machine guns, and batteries—will by no means pass unharmed. No. It is not indemnified; it is not the stout "black flame" that penetrates with knife between teeth into the enemy trenches, throwing grenades. It is a handful of gallant knights—half of whom may fall to earth—that can disperse and conquer the enemy, thus preparing at a "relatively light cost", victory for the foot soldier. Assault aviation, attacking at low altitudes, is or rather will be, an arm of sacrifice worthy of the strongest, in which all will be heroes.

AN AUSTRIAN ARTICLE

Militar Wissenschaftliche und Technische Mitteilungen, which for nearly seventy years has contained authoritative military opinion in Austria, has printed a number of articles on the subject. In October, 1929, Captain Ritter, writing in this magazine, expresses a belief that a strong "aviation of the line", with the mission of accompanying and assisting troops during the attack, is desirable. He thinks that this employment of planes will not hinder the execution of other bombardment missions by aircraft. He does feel, however, that aviation cannot do everything, and that material will limit the idea. In other words, in order to do all the things aviation is required to do, we shall need an all-purpose airplane. This single type will be necessary in order to avoid exigencies

of materiel and personnel; although a single type cannot accomplish all aerial jobs to perfection.

ALL ARMIES INTERESTED

The interest in attack aviation and its counter measures is by no means confined to the great armies and nations of the world. It is a subject in which all thinking military men of all nations are interested. Military periodicals in Hungary, Czecho-Slovakia, Denmark, and many other small countries, have published papers on the subject. A good example is the series of translated articles, the last of which has recently appeared in the Venezuelan La Revista Militar, on the subject of antiaircraft leads.

ORIENTAL ANTIAIRCRAFT PRACTICES

There is little to be found on the subject of Japanese or Chinese antiaircraft teachings. The Japanese have not used attack aviation tactics extensively. In the hostilities at Shanghai in 1932, and in Manchuria in 1933, their air force confined its aggressive work chiefly to bombing from safe heights. Altitudes considered safe have been unusually low, owing to the lack of antiaircraft fire on the part of the Chinese. The Northern armies, however, have recently been actively interested in antiaircraft measures, and the loss of at least one Japanese bomber has resulted.

CONCLUSION

We may come to the definite conclusions then, after realizing that the low-flying, attack plane is universally held to be a strong new instrument of war, that many minds of many nations are studying its uses and the measures to be taken against it; that interesting developments are bound to appear, either before or during the next war; and that, in general, our own progress along these particular lines, both in the air and on the ground, seems to compare favorably with that of other nations.

CHAPTER VIII

Infantry vs. Air Attacks

(HISTORICAL PROBLEMS)

These problems have for their basis actual occurrences during the World War and various hostilities since. Their object is to furnish material for instruction in the anti-aircraft tactics of small units.

Each brief historical narrative is stated as a situation and is followed by a requirement. Thus the reader may formulate his own solution before going on to read the actual historical solution which follows. The historical solutions are given as accurately as available sources indicate the measures that were taken.

A discussion concludes each problem, and in some instances a school solution also is given. The aim is simply to bring out points of instruction that are profitable. In the World War the aerial attack against ground troops was a new and startling factor. Hence there is much to be said in excuse of mistakes committed; for there was little or no precedent to go upon.

The aerial attack and its countermeasures are still subject to much discussion and difference of opinion. That they are also subjects of vital importance is shown in the foregoing chapter in which present doctrines and thought on the aerial attack against ground troops are discussed.

PROBLEM NO. 1

In March 1915, during the Battle of Neuve Chapelle a German sentry was walking post at night around the railroad station of a small town. The town was some distance back of the lines and was a minor supply center.

The night was clear, moonlit, and quiet. The sentry's tour had been entirely peaceful until he heard an airplane approaching. The plane came rapidly over the town and began to circle around directly over the sentry's head and drop bombs on the station, and the supply depots near it.

REQUIREMENT

The action of the sentry.

HISTORICAL SOLUTION

The sentry immediately opened fire with his rifle at the low-flying bomber. He continued to fire until the pilot flew close and threw a hand grenade at him.

DISCUSSION

The historical account does not tell us whether the sentry was hit or whether he retreated under cover. His firing and the bombing, however, brought the guard and other troops out to engage the hostile plane. The plane returned safely to its landing field but was out of action for several days because of damage from 36 hits made by ground troops. The bombing, on the other hand, caused 75 casualties and tied up railroad traffic for three days.

A little over a month later another German sentry was on post at night in the church tower of the same town. Again a hostile plane came over and bombed the railroad tracks and supply dumps along them, which were only a short distance from the church. The plane was flying at an altitude of 300 feet or less. Like the other sentry, this one opened fire with his rifle. He had several excellent chances at the plane, because at times it flew low enough to be on a level with his post, and he eventually wounded the pilot in the stomach. The pilot succeeded in dropping all his bombs, however, and was able to reach his airdrome; but he died the next day.

These simple accounts illustrate the desirability of opening fire on low-flying hostile planes at the earliest possible moment. Both German sentries deserved credit for their immediate action in engaging the enemy planes practically single-handed. In the second instance this fire resulted in the loss of a trained bombing pilot to the enemy.

It is not likely that the bombing of material will be done from such low altitudes in wars of the future. But the lessons indicated here are applicable to infantry antiaircraft measures against any type of low-flight attack: *The fire of a single rifle can kill a pilot or stop the engine of a plane. Moreover, all hits inflicted on hostile planes cause damage that requires time and work to repair, and consequently lessen the effectiveness of the enemy's forces in the air.*

PROBLEM NO. 2

Early in October, 1918, an American regiment in the Meuse-Argonne was in brigade reserve, with one battalion occupying positions in a small woods, and the other two near by. The regimental orders on the subject of measures against hostile aerial attack required the troops to take the utmost advantage of cover, and to remain still while hostile planes were overhead.

In the morning, low-flying German planes attacked several parts of the area with machine-gun fire and caused a number of casualties. Later, a large flight of hostile planes bombed the battalion that occupied the woods, again killing and wounding a number of men. It was apparent from these attacks that the German airmen knew the location of the regiment and that further attacks could be expected. The morale of the troops was adversely affected both by the attacks they had received and the expectation of those to come.

REQUIREMENT

Steps taken by the regimental commander to improve the situation.

A SOLUTION

The regimental commander directed that riflemen and automatic riflemen, within sight and reasonable range (1000 yards) of attacking planes, engage them with fire whenever they came over; and, further, that all machine guns with antiaircraft mounts engage enemy planes in the same manner.

DISCUSSION

The passive measures first adopted proved to be of little or no value. The regiment had been attacked twice, which indicated that its positions were known, and that other air attacks, and artillery fires also, were liable to be placed on them by the enemy. Therefore, there could be no objection to ordering the troops to fire on all low-flying planes. Moreover, this action was likely to improve the morale of the regiment considerably, by giving it the chance to fight back at a harassing, but plainly visible, enemy.

Actually, however, the commander of the regiment in the Meuse-Argonne made no changes in his antiaircraft orders. But the next time hostile planes came overhead,

a number of men opened fire upon them without orders. This fire, which was apparently allowed to continue freely after it had once begun, brought down three German planes in the regimental area. Needless to say, the troops were greatly heartened, and enemy planes became somewhat chary of flying too low over that particular regiment.

In another American infantry regiment, which was sent up to occupy trenches in the Ypres sector in June, 1918, the regimental commander enforced active measures from the beginning, ordering all riflemen and Lewis gunners to fire on all hostile observation and attack planes that came within range. About 4:30 PM one afternoon, a day or two after occupying their positions, the front-line troops of one battalion of the regiment were attacked from the air while eating their evening meal. The German plane approached from a flank and opened fire on the line of trenches, whereupon the troops seized their weapons and brought it down in short order. These troops gained great confidence by crashing the first plane that attacked them.

The best answer to an aerial attack is concentrated fire. Unless there is special reason to the contary, all ground troops should fire at every hostile plane that flies over them within sight and range.

PROBLEM NO. 3

It is a night of black darkness in August, 1918. An American infantry battalion has been moving up for several hours toward the position from which it is to jump off at dawn. The battalion is now halted in column of twos along a forest road. The trees close in over the road so that even in daylight the battalion would have considerable cover from the observation of all but close-flying hostile planes. Nevertheless, the troops are taking every precaution against observation either from the ground or the air. There are no lights.

Planes of every kind, hostile and friendly, have been overhead since early afternoon. The troops have been talking about them and wondering what they are doing. There is a rumor to the effect that German bombers have been attacking our artillery. The frequent, and in fact, almost continual sound of airplanes above the route of the battalion has caused a general disregard of them except for the usual precautions against lights.

While the companies are halted, waiting in the intense darkness for the order to resume marching, a plane of some kind approaches and circles over the woods. It is not very far up, and makes so much noise that other sounds can hardly be heard. The plane is heard to move a little away from directly over the column. But half a minute later it sound grows louder again as it turns and comes back.

REQUIREMENT

Actions or orders by unit commanders, if any.

HISTORICAL SOLUTION

Apparently no orders were given. The battalion remained in column of twos along the road. The German plane, for such it was, flew back directly above and along the column, and dropped a number of bombs in rapid and accurate succession, striking every company. There were more than a hundred casualties, and of that number a quarter were killed. The road was so badly torn up that it was blocked for wheeled traffic. The tactical result of the aerial attack was to delay the battalion so that it could not make the attack planned for the next morning.

No shots of any kind were fired at the plane.

DISCUSSION

The mistake here was to permit troops to remain in close formation on a possible route of approach when there was reason to believe that hostile attack planes were active in the vicinity. The darkness and cover may have seemed to be protection enough. But the German flyer could not have laid his bombs more accurately had the regiment been on an open road in broad daylight. It was not by chance that this occurred, although he may not have known that there were troops on the road.

At the first approach of the plane small unit commanders should have ordered their troops into the woods a few yards, there to remain prone until the plane attacked or left the neighborhood. This one measure would have reduced the number of casualties considerably.

The plane was invisible to the troops. Firing at the sound would have given away at once the presence of the regiment in return for only a remote chance of putting the plane out of action.

PROBLEM NO. 4

In 1932, a Khivan chieftain, whose followers numbered several thousand Turcoman tribesmen, had been causing trouble to the Soviet government. He and his people preferred their nomad independence to Soviet regimentation. They had shown their feelings clearly by raiding outlying government posts and by refusing to submit to Soviet influence.

The Soviet government determined to break the tribes' spirit by attacking them from the air, and accordingly sent twenty-five light bombers to a point within striking distance. At this time the tribesmen were camped among the sand dunes of a desert. They had no towns or fortified villages but lived in blanket tents, moving frequently from one desert site to another. The Turcoman leader of the tribes received warning from friendly sources that an air attack was probable.

REQUIREMENT

Action taken by the Turcoman leader to protect his forces.

HISTORICAL SOLUTION

The chieftain surrounded his camp with rings of listening scouts who were instructed to fire their rifles as soon as they heard or saw approaching planes. In this manner the warning was to be relayed in to camp from a long distance. The subordinate leaders were instructed to move their tribes and animals out of camp at the warning signal and to place them on the shady side of sand dunes, there to remain as motionless as possible until the attack was over. The Soviet squadron attacked the camp on two different occasion, thoroughly bombing it with gas and high explosives. Because of losses in the past from ground fire, the bombers remained well above rifle range during their operation. Thus they apparently failed to notice the absence of the tribes, which, in their scattered positions, were invisible from high altitudes. The Turcomans suffered no casualties from either attack.

DISCUSSION

The Turcoman leader saved his force by a clever ruse. Had the Soviet planes attacked at low altitudes, however, their pilots would have discovered that the camp had been vacated and would have searched the vicinity for the tribesmen and doubtless found them. The leader could well have given further orders directing that all possible fire be placed on the planes in this eventuality.

The most important point, however, that this problem brings out is the efficient use of distant listening posts and warning signals. In a number of tests, conducted since the World War, the average time of warning that ground troops have, when attacked by low-flying planes, was found to be twenty seconds. In these tests, the troops were in march column; and listening guards, marching a short distance out from the column, gave the alarm as soon as they first heard planes approaching.

Twenty seconds is a very short time; but is long enough to give troops a chance to deploy hurriedly and fire at least one shot as the attack passes over. At the same time, any practicable method of increasing this period of warning is highly desirable. Recent French and German army instructions make use of a "watch and warn" guard, which operates by bounds from high point to high point, protecting the column as it proceeds.

More important, however, is the possible application of a long distance method of warning against low aerial attack upon bivouacs and rear area installations, especially at night. Even a full minute's warning would give anti-aircraft units a far better chance to be ready to meet such an attack. During the latter part of the World War general warnings were issued when planes penetrated across the front lines at night. In fact, the aerial patrol over the North Sea was often able to radio a warning to England of approaching German bombers, this in time for British fighting planes to take the air in numbers sufficient to combat the hostile squadrons. But the greatest need to infantry, both in bivouac and on guard over rear area installations, is an efficient system of antiaircraft guards that will increase the period of warning immediately before an attack. The Turcoman chieftain's method worked well for him, and should for any other body of troops, although, at night, light signals would probably be the best means of rapid warning.

PROBLEM NO. 5

In September, 1914, a British company of infantry, some distance behind the lines, was marching up the road towards Mons. The day was clear; and the country through which the column passed was, in general, open and flat.

An airplane appeared some distance off to one flank. It was flying at an altitude of only a few hundred feet and in a direction that would bring it over the column. As it came closer no markings were visible under its wings.

REQUIREMENT

Order, if any, given by the British company commander.

HISTORICAL SOLUTION

The company commander ordered his unit to fire at the plane. It was a British plane, and, fortunately it was not hit. The pilot of the plane spent the entire ensuing night painting the Union Jack on the bottom of his lower wings.

DISCUSSION

The British commander took the correct action. At that early date planes had not been used to attack ground troops. Nevertheless, their value as efficient means of directing artillery fire and obtaining information was already well known. The plane had no identification markings. Apparently the officer in command of the ground troops decided that the unmarked aircraft was piloted by a hostile observer on a scouting expedition, and acted accordingly.

Planes should not fly low over friendly ground troops when such flights can possibly be avoided. When such flights are necessary the ground troops should be notified in advance, if possible. *Ground troops should fire on all low-flying planes unless they are known to be friendly.*

PROBLEM NO. 6

During the Battle of Cambrai (November, 1917) a German unit, disposed along the edge of a woods, has successfully defended its line against repeated British attacks. It is now mid-afternoon; and since dawn the British have striven to capture the woods. It is not apparent whether they have given up hope; yet they have attempted no strong advance for two hours.

Near the right of the woods is the strongest defensive point, a slight elevation which commands the entire front of the woods. The German unit occupying this position has smothered every hostile assault with flanking fire and continues to pin the enemy to the ground almost every time he moves.

About 4:00 PM a plane comes low over the ground from in rear of the British lines, and, after a brief reconnaissance, dives at the German strong point and delivers machine-gun fire upon it from an altitude of less than fifty feet. At the same time the British infantry opens up with every available weapon on the same target. The British plane is circling to attack again.

REQUIREMENT

The orders of the commander of the German strong point.

HISTORICAL SOLUTION

The German commander directed intense fire to be placed on the plane as it attacked. As soon as it had passed the defenders took up the ground fire fight again. After the plane had made several attacks the troops' antiaircraft fire took effect: the British airman was killed and his plane destroyed in crashing.

DISCUSSION

The duration of a single aerial attack is only a few seconds. Those same seconds comprise the period during which the plane is most vulnerable to ground fire. Infantry, attacked from the air while engaged in a ground fight, must turn its attention momentarily to the destruction of the hostile plane. In such a brief period the hostile ground troops are not likely to gain much ground; and besides, the loss of an airplane and its pilot, in the broadest sense, it a greater blow to the enemy than the loss of a number of infantrymen.

Airplanes are not likely to be used in modern warfare in direct support of infantry, unless the enemy is making a supreme effort to take or hold ground. The best historical example of this was the German and Allied employment of hundreds of planes on the battlefields of the great Spring offensive in 1918. Every nerve was being strained by both sides.

Infantry that undergoes attack from the ground and the air at the same time should reply to the air attack during the few seconds it lasts. Certain machine guns, emplaced in advanced positions that command broad stretches of terrain to the front, may well continue to fire at ground targets; but all other weapons should be turned upon hostile planes.

CHAPTER IX

The Raid on Adam House*

In early summer of 1918, the little army of Belgium, which had been holding grimly to its bit of the line ever since the German masses had swept it aside in 1914, held, among other sectors, that of Brielen. The Brielen sector had been reclaimed by the British in their advance on Passchendaele and Moorslede in 1917, and had, in fact, formed a highly organized part of their rear zone. Now, however, the spring drive of the Germans had driven the British back until the Brielen sector was once more a part of the front line; and changes in the Allied dispositions had brought about its occupation by the Belgian 2d Army Division.

In that part of the sector assigned to the Belgian 7th Line Regiment, as in the rest of this region, there were many evidences of the former British occupation. Concrete emplacements and complete trench systems were abundant. Temporary hutments, now deserted, lay between the lines. The woods that stretched parallel to the opposing lines at this point were marked by signs "Kitchener's Woods." (Figure 36, repeated several times in this chapter.) And the Belgian troops argued the point as to whether the woods actually bore the name of Britain's famous general, or had simply been designated as a bivouac for the British kitchens.

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*This account of the raid on Adam House is based on the article "Raid sur Adam House executé dans la nuit du 21 au 22 juin 1918 par le groupe des patrouilleurs du 7e Regiment de Ligne" by Capitaine de reserve Rousseaux, in the Bulletin Belge des Science Militaires, June 1934.

Not far beyond the northeast corner of Kitchener's Woods there stood, between the opposing outpost lines, an emplacement almost as large as a small fort. Originally the cellar of an old Flemish inn, "Adams Huis", it had, naturally enough, appeared on British maps as "Adam House". And when the Belgians replaced the British they found it convenient to keep the name as it appeared on the maps turned over to them.

The rear entrances to Adam House, since it had been built as a defense against the Germans, faced the present Belgian lines. The Germans, however, had now thrown up a redoubt paralleling the rear wall of the old cellar itself, for defense against Belgian attacks. A broad plank road running to the eastward through and beyond the woods, passed by its doors. The Belgian outpost sentinel, posted in the edge of Kitchener's Woods 200 yards to the west, could see Adam House, lifeless and dreary, standing against the skyline, and almost peer, with the aid of his field glasses, into the black squares of its doors, the upper parts of which extended above the redoubt.

The British had informed the Belgians that Adam House was unoccupied; and certainly there was no sign of life. For it had every appearance of abandonment and vacancy common to all the other emplacements, hutments, and trenches of the vicinity that had once echoed the accents of the Cockney or the Scot.

Lieutenant Rousseaux, who commanded the outpost op-

posite Adam House, noted that it was the strongest point in the flat terrain to his front; that it jutted out threaten-

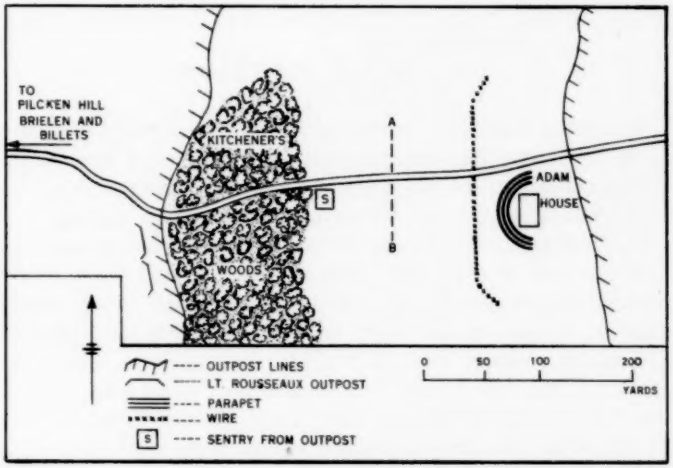

FIGURE 36

ingly from the German lines toward his own; and that it was capable of defense from any direction.

REQUIREMENT

The action of the Belgian outpost commander with regard to Adam House, upon the relief of the British.

HISTORICAL SOLUTION

Lieutenant Rousseaux viewed Adam House with suspicion in spite of the British clean bill of health and thought it strange that an alert enemy should not have even a cossack post to guard it. Therefore, on his first day on outpost he found time to watch Adam House for an hour or two through his glasses. But he saw nothing whatever. Again, on the second day, he observed from the forward edge of the woods for over an hour, through field glasses resting on a small log. But again there was no sign. At all times, too, the Belgian sentinel at that point kept watching for possible tenants in Adam House. Neither by night or day did they see anything to report.

Lieutenant Rousseaux decided that the British had been right and that it actually was empty. He determined, however, to visit the big emplacement with a patrol, in order to be absolutely certain.

On the morning of the third day the outpost commander instructed a small patrol to reconnoiter the spot, but just as it was ready to move out, he took another good look at Adam House. A slight movement caught his eye, and a moment later he saw for an instant the head of a German soldier passing by on the inside of a doorway. A little more observation, and he saw what he thought was a second German.

REQUIREMENT

Lieutenant Rousseaux's further instructions to the patrol.

HISTORICAL SOLUTION

The Belgian officer immediately called off his patrol and told the men to return to their outpost positions. He now knew what he wanted to know—that there was an enemy garrison in Adam House. There was no need to risk the lives of his men to answer a question already answered, at least, in part. Continued close observation and, perhaps, patrols sent out by night instead of day would determine more closely how strongly Adam House was manned.

But that afternoon an order went out from the division commander to all parts of the line directing that units capture prisoners. The high command desired accurate information concerning the enemy. Lieutenant Rousseaux, on learning this, at once recommended to his regimental commander a raid on Adam House. His suggestion was approved; and he immediately began preparations for the raid, no definite date for which had yet been set.

REQUIREMENT

What was the outpost commander's first step in preparation for the raid?

HISTORICAL SOLUTION

Lieutenant Rousseaux immediately decided that as complete information as possible of the terrain between the Belgian lines and Adam House was of vital importance to the success of a raid. Upon careful examination of this ground he saw that it was possible for a small patrol to creep up the ditch on the north side of the plank road almost to a point across the road from the house. Where the road led out of Kitchener's Woods this ditch was deep enough so that the crown of the road would conceal crawling men from observation by the Germans in the emplacement, and it was apparently of the same depth for the whole 200 yards. Accordingly, that night, he sent a small patrol along this route to merely reconnoiter it.

The patrol had almost reached a point across the way from the old inn when it ran into barbed wire. The entanglement was an old one, but well made and in good condition still, in spite of much rust. Thorough reconnaissance disclosed that it extended for some distance to the north from Adam House and had no breaks. It blocked further advance by the patrol. The patrol leader returned to the woods and reported what he had found.

Lieutenant Rousseaux decided to wait until the next night, and then send another patrol up the ditch along the south side of the road to determine whether the wire extended across the road in front of Adam House itself. This time, the lieutenant went along, taking with him his

two sergeants and several men in order to familiarize them with the ground at night.

The patrol crept forward through the dark until it again encountered the wire. It left the ditch and moved east to a point where the wire is just a few feet from the four-

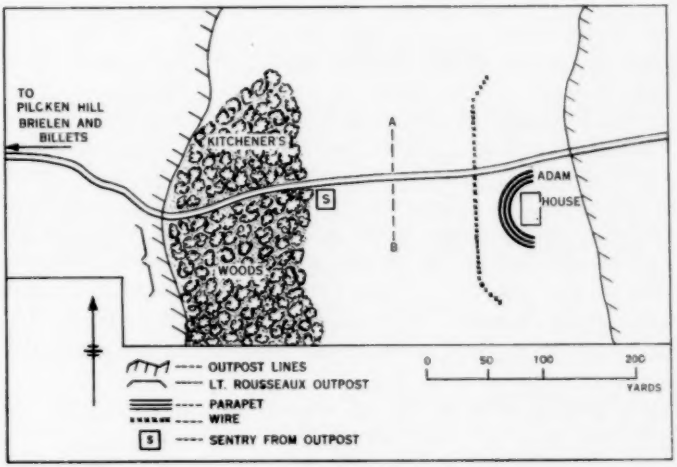

FIGURE 36

foot parapet of the redoubt. Here the patrol had hardly paused when some slight sound alarmed the enemy sentinel. Immediately a German machine gun on top of the parapet opened up, firing into the dark at a range of about ten yards.

REQUIREMENT

Action of Lieutenant Rousseaux.

HISTORICAL SOLUTION

The surprise of the hostile fire was so great, and it was so exceedingly close, that Lieutenant Rousseaux, like the rest of his men, threw themselves flat on the ground. This instinctive action, so close were they to Adam House and the machine gun, saved all but one man. One of the two sergeants was hit before he could throw himself down. But all the rest, once prone, were in the shelter of a small dead angle formed by the top of the redoubt parapet. The enemy gunner could not depress his gun low enough to hit them.

Rousseaux then succeeded in getting all of his men, including the wounded sergeant, into a shell hole, and from there back to the road ditch, without further loss. The night was fortunately very dark; and like as not, the German sitting at the machine gun had little idea of what he was shooting at or where it was.

By slow degrees the patrol returned to the woods with its one casualty. The wounded sergeant was then sent back to the nearest aid station but died before reaching there.

The results of this patrol changed completely the Belgian information of Adam House. Instead of a weakly held cossack post, with one or two sentinels, it was apparently a well protected strong point of the German line.

On the day following, the full order for the raid was received, although D day and H hour were not yet announced. Lieutenant Rousseaux went ahead with careful plans for the eventual raid.

REQUIREMENT

What further preparation did the outpost commander make?

HISTORICAL SOLUTION

In a field, well to the rear of the outpost, Lieutenant Rousseaux laid out schematically the terrain over which the raiders must go to reach Adam House. And every morning his men went through a simulated attack. He had his non-coms make an accurate map of the terrain and study it until they knew every square yard of the approach to, and the vicinity of, Adam House by heart. He considered every eventuality he could think of and made a plan to meet it. He conducted daily grenade practice. Each night, moreover, he took his men farther and farther out into No-man's-land toward Adam House until they could almost tell by the feel of the ground where they were. He also, in accordance with the order for the raid, got in touch with the artillery and signal corps units that were to cooperate with his platoon in the raid, making sure that every point of his plan was clearly understood.

Finally, on 21 June, the news came that the raid would take place that night at 11:30. The order stated, in accordance with an excellent Belgian custom, that there would be a bottle of wine for every member of the raiding party who returned.

The raid order called for the actual raid to be accomplished by Lieutenant Rousseaux and his outpost group. In addition, two groups of a noncommissioned officer and six men each were assigned as covering detachments, one for each flank. The covering detachments were to accompany the raiding party as far the line *AB* shown on the map, and there guard against a possible flank movement on the part of the Germans.

The raid order also called for 200 rounds of light artillery fire for the destruction of the barbed wire, and preparation fire of three minutes duration by the heavy artillery. The fire for the destruction of the entanglements was to take place the afternoon before the raid, and the prepara-

tory fire was to immediately precede, of course, the raid itself. The heavy guns were also ordered to lay down counterbattery fires during the operation.

At 10:00 AM, Lieutenant Rousseaux assembled his men for inspection. He checked their equipment, distributed ammunition, and spent some time going over the specific duties of each man during the raid, clearing up what few points were not already perfectly clear.

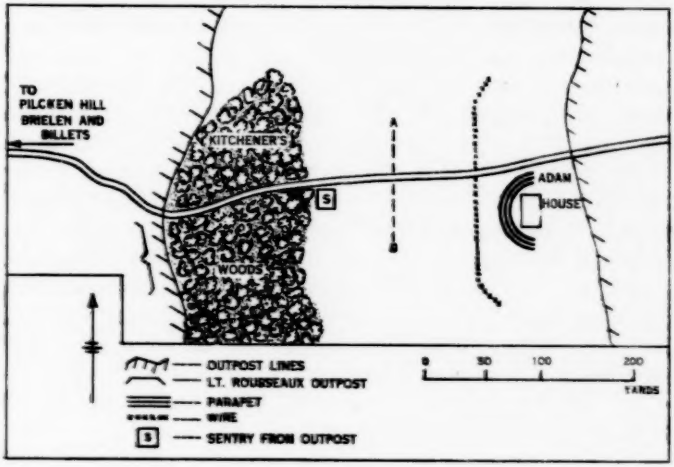

FIGURE 36

Then, early in the afternoon, Rousseaux borrowed a bicycle and rode out toward the outpost lines to watch the artillery fire against the entanglements. Going forward on foot as soon as he came to the rear of the Belgian trench system, he found the artillery liaison officer, and a telephone operator, ready to begin. Although the range was 4,000 yards, only one shot was wasted in registering on the wire. The second shell was a direct hit on Adam House itself just a few feet from the wire; and by the time the other 198 rounds had come over there was little left of the entanglement.

Rousseaux observed the results of the fire through his field glasses and made notes of the few spots in front of Adam House where the wire still stood when the destruction fire was finished. He watched carefully for signs of activity in Adam House but saw none. He decided that there was probably no day garrison, or possibly only a sentry or two. At the end of the firing, Rousseaux shook hands with the liaison officer, complimenting him on the accurate work of his battery and bidding him "good luck" until they met again at H-hour.

On returning to the billets, Rousseaux found the truck, which was to carry his platoon forward for the raid, already at hand. The chauffeur reported to him with 40 bottles of wine. Rousseaux locked up the wine, and then reported to his colonel the results of the fire on the barbed wire. At mess that evening the whole regiment talked of little but the coming raid.

At 9:00 PM, the raiding group assembled again, ready to move forward. A final inspection of equipment, an issue of six grenades to each man and a double sack of Mills bombs to the regular grenadiers, and the platoon was ready to entruck. As the last men were climbing in, the colonel arrived to wish them success, and ask Lieutenant Rousseaux to telephone him the result of the raid as early as possible.

On the way up, the men gave every sign of eagerness and high spirits. When they were still several kilometers from the trenches, one man began to sing a popular song at the top of his voice.

REQUIREMENT

Action of Lieutenant Rousseaux.

HISTORICAL SOLUTION

Lieutenant Rousseaux joined in the chorus.

The raiding party left the trucks at the top of Pilcken Hill and went forward quietly to the outpost. There the covering detachments reported; and in a few words Lieutenant Rousseaux explained the mission of the raid to the noncommissioned officers in command. He further explained that both the covering detachment and patrol would leave the edge of the woods at 11:15 PM; that the covering detachments would drop off at the line *AB*; and that the patrol would continue toward Adam House a short distance and there deploy and wait for the heavy artillery barrage due at 11:30 PM.

At 11:00 PM the supporting artillery called and watches were synchronized. Fifteen minutes later the raiders prepared to move out toward Adam House.

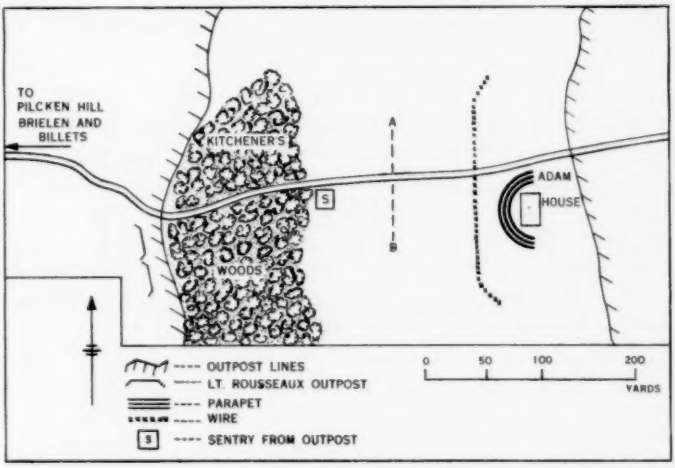

FIGURE 36

REQUIREMENT

The formation taken.

HISTORICAL SOLUTION

The raiding party crept forward in two columns, single file, along the ditches on each side of the plank road. Lieutenant Rousseaux accompanied the column on the right. The covering groups followed in rear and detached themselves at the line *AB* to take up covering positions.

The two groups of the patrol kept moving with the utmost care and stealth until they came to a point roughly 100 yards from Adam House (just ahead of the line *AB*). There they spread out quietly in a close deployed formation and then lay prone to wait for the artillery preparation. The night was still, warm, and as dark as the raiders could wish. And apparently no untoward noise had betrayed their approach to the occupants of Adam House.

The artillery delayed slightly commencing fire. But before Lieutenant Rousseaux and his group leaders reached any great state of apprehensiveness as to possible error or misunderstanding, the shells began to fall. The fire on Adam House itself was to last for three minutes. It came down accurately on and all around the stout target. A minute before it lifted the raiders began to move forward toward the enemy emplacement. So closely did they creep toward the friendly artillery fire that as the fire shifted a hundred yards or more to the rear to form the box barrage, the Belgians found themselves advancing over the old barbed wire, little of which was left intact after the two bombardments. With a rush the raiders were through

the wire and directly under the parapet, safe for the moment at least from the fire of the German machine guns directly over their heads on the parapet. The charge on

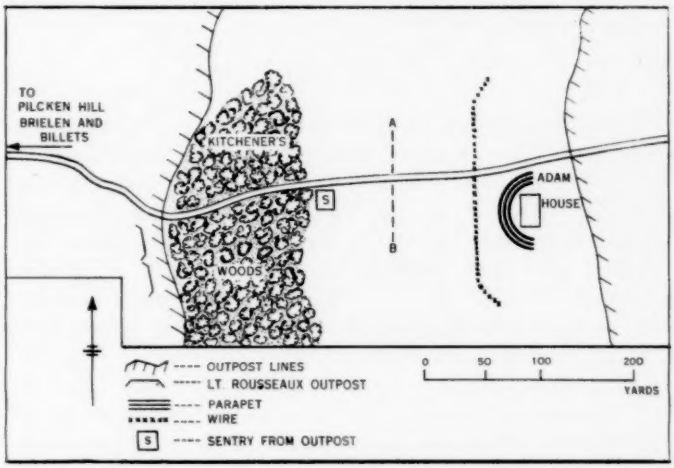

FIGURE 36

Adam House had been so well timed to follow the artillery preparation that no machine guns had yet opened fire.

REQUIREMENT

The next action of the raiding party.

HISTORICAL SOLUTION

On reaching the parapet the raiders at once began to toss Mills bombs and grenades over its top. Lieutenant Rousseaux shouted "Grenades! Grenades!" to increase the throwing. Almost at the same moment six Germans came around one end of the parapet and opened on the Belgians with their rifles at less than 10 yards. The Belgians replied in kind. A second later Rousseaux saw another German above him on the parapet, trying to straighten up a machine gun that had been knocked over by the artillery fire. He got the man with his pistol. A Belgian grenade rolled back off the parapet against Rousseaux's arm. He dived headlong away from the grenade and the parapet, and the grenade went off just as he hit the ground. He was unharmed.

More German heads appeared above the parapet.

REQUIREMENT

Rousseaux's next move.

HISTORICAL SOLUTION

Rousseaux gave a command to charge and the Belgians went over the parapet into the trench-like space between the parapet and Adam House itself. His men threw grenades in the door. The Germans in the trench surrendered at once, and after the first explosions those inside Adam House began coming out with their arms up. There were eight Germans altogether still alive.

REQUIREMENT

What does Lieutenant Rousseaux do now?

HISTORICAL SOLUTION

Rousseaux and one of his sergeants searched Adam House for papers, maps and anything else that would furnish information. In the meantime, the other sergeant called the roll, and when Rousseaux came out of the old cellar, reported that three members of the raiding party were wounded, and none dead.

Then the party started immediately to the rear with wounded and prisoners. As they made their way back along the road, Rousseaux realized that the Belgian artillery was still firing its covering barrage. On reaching Kitchener's Woods, he directed a Very Pistol signal to be fired to inform the artillery that the raid was over, picked up the covering detachment and continued on back. Just as the raiders reached their own trenches in the outpost line, the German artillery opened up. But every man, including the wounded and prisoners, tumbled into the trench to safety.

Rousseaux then sent the wounded to the aid station, called the roll again, and then led the group back to the truck. On arriving at the billets, he complimented his men, issued out the wine, and then received himself the felicitations of his colonel.

DISCUSSION

The Belgian raid on Adam House differed only in minor respects from many another raid conducted during the World War. This particular operation is, however, an excellent example of a carefully planned and conducted raid with the attention to detail that is absolutely essential to success.

First, Lieutenant Rousseaux made his plan simple and capable of being carried out with the utmost rapidity, once the raid was under way. He familiarized the raiding party with every inch of the ground to be covered and rehearsed the raid until his men were letter perfect in their parts. He made sure of complete understanding and cooperation by his supporting artillery—this by personal contact. And during the raid itself—the first he had ever led—he showed himself to be a capable leader.

The main point in the raid on Adam House that is questionable is the use of artillery fire for destruction of wire entanglements several hours before the raid. Such fire may destroy the wire, but it always amounts to sending a message to the enemy: "We are going to raid you tonight". During the War, however, such fire was often employed. Nevertheless, cutting the wire by hand, or the use of Bangalore torpedoes—sections of pipe full of explosive, which are slid under the entanglements—are far better means for effecting passage of the wire. The wire is cut, or the Bangalore torpedoes used, during the raid itself and not sometime before.

There is also some doubt as to whether the preparatory artillery fire, immediately preceding the raid, was desirable. Adam House extended somewhat into No-man's-land, and was apparently a detached post. Hence a "silent raid", without the use of artillery might well have been effective. On the other hand, the Belgian raiding party used only the briefest of artillery supporting fire and followed the lifting of the fire so rapidly that men actually reached the German parapet before the enemy had recovered enough to take their defensive positions.

CHAPTER X

Negative Aerial Information

"An airplane . . . may report: 'No enemy seen in town of X'; but not: 'No enemy in X', because the enemy may have been concealed in houses."
—Paragraph 139c(2), Special Text No. 16, Army Extension Courses.

Valuable as aerial observation is in gleaning information of the enemy, it can rarely make a negative report that a ground commander can accept as definite. It is largely limited to reports of things actually seen, rather than those not seen. The infantry commander receiving these reports must remember that they are indefinite, and must not make the mistake of placing too much dependence upon them.

EXAMPLE NO. 1

During the Philippine maneuvers of 1932, a Blue battalion, reinforced by a rifle company and a machine-gun company, took up a defensive position on the edge of a large village which lay entirely within a thicket of bamboo. The battalion commander directed all his units to select positions that had good overhead concealment. Not long after this order had been carried out, a Red plane came in over the bamboo and circled around several times at a height of 300 feet. The pilot and observer could both be seen peering over their cockpits in an attempt to discover what was beneath the thick growth of trees.

The Red plane returned to Red headquarters, landed, and reported that after a thorough reconnaissance its occupants had observed only two small groups of Blues in

the village. The observer reported, also, that no other Blue troops were seen anywhere in the open country, which extended for several thousand yards around the village.

The Red commander had assumed up to that time that the village was the logical place for the Blue battalion to organize for defense. Earlier reports from other sources had indicated this. But here was a report that seemed to indicate definitely that only a small number of Blues were there. "They can't be anywhere else," the Red commander said. "There isn't another spot within miles big enough to hide a platoon, much less a battalion."

A staff officer then suggested that, if that were true, the fact that the Blues were seen in the village at all should be taken as indicating that the bulk of the Blue battalion was there, rather than in the open country around the village, where nothing had been seen by the plane. "It is harder to see through the bamboo growth than in the open. The observer saw no Blues in the open around the village; but did see some in the village. Hence his report is, more than anything else, an indication that the battalion *is* in the village. Added to what we knew before, the report makes it more probable, rather than less, that the Blue battalion is right where we thought it was." After some discussion, the Red commander decided to accept this interpretation.

DISCUSSION

Here, the Red commander was too ready to accept the negative report of his observer as definite indication that the village and its surrounding thicket contained only the few troops seen and not the force that he had expected it to. Possibly, also, he felt that bamboo, which appears to be thin enough cover when viewed from the ground, must be just as easy to see through from the air, when as a matter of fact it offers considerable concealment from overhead observation. The fact that the plane had to come down to an altitude 300 feet, and circle about for two minutes in order to see anything at all, could well

have been taken as measuring the difficulty of observation. But to return to the main point of this discussion, the staff officer who advised the Red commander, followed the correct line of reasoning. He took the Red plane's information only for what it was worth; but added to other and earlier information, it was worth a great deal.

EXAMPLE NO. 2

In June 1925, at Douaher, Morrocco, a French battalion (advance guard) that had been trying to catch up with a highly troublesome and mobile body of Riffs, observed them apparently digging entrenchments on high ground some 3000 yards to the front. Although, at such a distance it was difficult to determine the nature of the works under construction, digging of some kind seemed to be in progress. The Riffs had before then proved themselves thoroughly familiar with ground organization; hence the French advance guard commander felt justified in sending a request back for an observation airplane to examine and report upon the hostile field works under construction.

A few hours later a plane came up to reconnoiter. Gingerly diving down over the Riff position—the Riffs had also previously shot down several low-flying planes with rifle and light machine-gun fire—the observer flew low enough to get a good look at the ground. He saw nothing and received no ground fire. Circling about, he passed over the supposed defenses again at a very low altitude and examined the whole hilltop thoroughly. He then flew back over Douaher and dropped this message to the advance guard commander:

We saw no trenches on the hostile position, nor any work at all underway.

A day or two later, when the French attacked, they found the hostile ground completely organized, with a trench system, excellently camouflaged, that must have taken the best part of a week to build.

DISCUSSION

Apparently, from the historical account, the French advance guard commander knew that the Riffs were not only adept at entrenching but at camouflaging also, and took the aerial report for exactly what it was worth. It would have been very easy for him to decide that the ground observers who reported signs of digging were mistaken, or had exaggerated what they had seen. A more inexperienced leader, failing to take account of the Riffs' knowledge of camouflaging, might all too readily have made the wish the father of the thought, and decided that there actually were no Riff trenches.

EXAMPLE NO. 3

Our concluding example, although similar to Example No. 1, occurred in war, instead of peace-time maneuvers. It illustrates better, perhaps, than any other incident in the history of war since airplanes have been used, how extremely important it is for a commander to evaluate correctly negative, or apparently negative, information.

The French Third Army was, on 21 August 1914, fully as eager to hasten forward to victory as every one of its sister armies. But on that day its expectations of immediate glory were somewhat dampened by a Third Army bulletin, which included, with other information, a statement to this effect: "The southern part of Luxembourg is occupied, especially to the southeast; but only movements of no importance have been observed there. *A few bivouacs of infantry and artillery are reported between Etalle and Arlon.*" (See Figure 37.)

This information meant, in effect, that there was no enemy force worthy of the foeman's steel immediately to the front, and that the decisive encounter every French unit was thristing for was not to occur for at least one or two more days. In fact, this news could even mean that

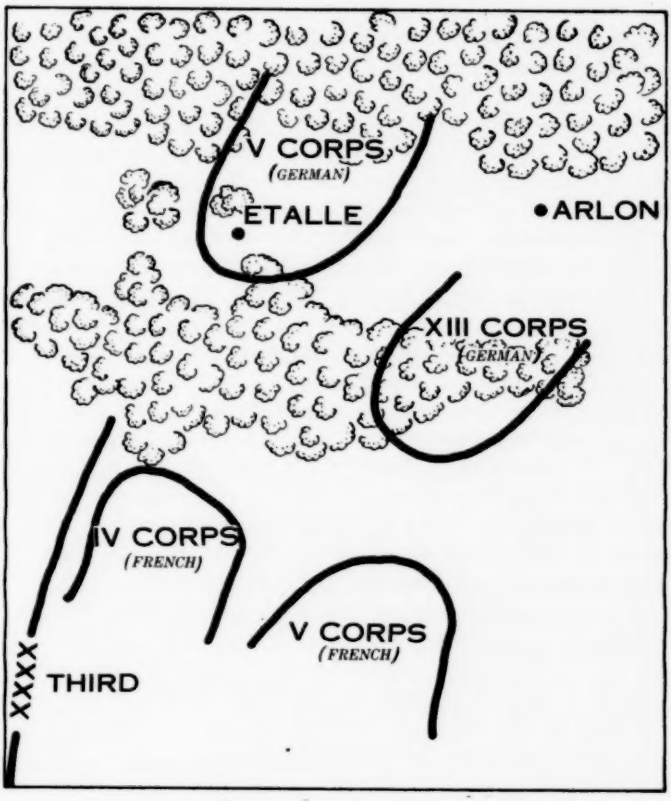

FIGURE 37.—French Third Army and opposing forces on evening of 21 August, 1914

the Third Army might play only a secondary role in the coming battle.

How incorrect and misleading the Third Army's bulletin of 21 August was, and how disastrous the consequences, has been thoroughly brought out by numerous writers. Only one aspect of the subject is particularly applicable t the present discussion. That aspect is embodied in the last sentence of the extract given above from the Third Army bulletin of 21 June: "A few bivouacs of infantry and artillery are reported between Etalle and Arlon." For this information was based on aerial reconnaissance.

This intelligence was taken by the IV Corps of the French Third Army to mean that no serious opposition would be met on 22 August—that only a simple march was to be made. It was apparently intended by the Third Army to convey that idea; and certainly no one but an extremely cautious IV Corps commander could have read any other meaning in its lines. The spirit of the offensive, bent only on rushing forward to shatter the German battalions, was all pervasive. The information that there was nothing ahead worthy of the serious attention of a valiant corps brought only disappointment; and in the wake of disappointment, carlessness and unreadiness.

But the airplanes that had searched the area between Etalle and Arlon had done their work under grave disadvantages. In the first place aerial observation was a new science. Careful methods of reconnoitering had not been perfected. Again, much of the Ardennes area was not only broken but heavily wooded; there was enough overhead concealment just to the north to hide the whole German army. Finally, the weather had been abominable for flying. The frail observation planes of that day had gained the air only at considerable risk, and more than one was damaged in the attempt. Fog, too, hindered the work of observation.

These circumstances alone should have been enough to make the Third Army weigh carefully the information that the planes brought in. But, no; in spite of the fact that there was ground intelligence enough to raise sus-

picions of the true state of things, the results of the aerial observation appeared to settle the matter. At least the Third Army, as we have seen, issued a bulletin indicating by inference its belief in what the flyers had reported, and failed to give the IV Corps other important intelligence. And on 22 August, that corps, instead of completing a simple day's march, encountered the enemy in force before even the morning had passed.

DISCUSSION

Although this particular part of the Battle of the Frontiers contains a score of lessons for the student of modern warfare, not the least of them is the one that we have brought out. The incorrect evaluation of aerial intelligenence was only one of the disastrous errors, committed by the French, that led to defeat. Whether the final result would have been different, if the Third Army had correctly discounted the reports of its aerial observers, is, of course, impossible to say. But surely the IV Corps would have advanced more cautiously and better prepared for battle had this been done.

To a careful interpreter, the French flyers' reports should have meant one thing: "There *are* German units in the area." How large the hostile force was, was in no way indicated. The fact that some units had been seen through fog and dense woods, and under difficult flying conditions, was indeed more a cause for alarm than assurance. Later events were to prove that the V German Corps was already occupying the area that the French flyers had reconnoitered.

CONCLUSION

Negative information from observation aviation is indefinite and must be carefully weighed. Commanders, moreover, must consider such information, not as final, but in the light of all other intelligence at hand.

The correct evaluation of such intelligence is not difficult, provided the interpreter lays stress upon what has been seen, rather than upon what has not been seen.

CHAPTER XI

Operations of Company H 9th Infantry November, 1918

BY

CAPTAIN WALTER P. O'BRIEN, INFANTRY

(With foreword by Brigadier General R. O. Van Horn, who commanded the 9th Infantry at the time.)

FOREWORD

I have read Captain O'Brien's account of the operations of Company "H", 9th Infantry, during the last phase of the Meuse Argonne. To the best of my recollection the details are accurate, and from a company commander's viewpoint, cover just about what happened. The operation was briefly a series of three night marches—almost continuous—, the last two of which were made through and to the rear of the German lines; and it well illustrates the action of following a defeated force to exhaustion.

In connection with the 3rd night march (night November 5-6) the following might be of interest. The 1st Division was ordered to come up the night of November 5th, relieve the 80th Division and jump off at daylight November 6th with other elements of the American Army, moving north from an east and west line through Beaumont. East of that line, flowing north and south and at a distance from one to three miles, was the Meuse River.

The 2d Division was ordered to protect the right flank of the 1st Division and cover this territory. The 9th In-

fantry was assigned that task. The country west of the Meuse was generally open and bare. The enemy in this section had retreated east of the Meuse toward Carignon. Resistance or fire, if any, could be expected only from that direction. An advance north, just west of the river, would have been disastrous, even if nothing more than a few machine guns were in position protected from attack by the river.

It was decided to accomplish this mission by taking up a central position in the Bois de Hospice from which the entire stretch of the river could be covered so that no enemy could cross. This was the reason for the third night march—to get across the open country west of the Meuse before daylight. The leading elements of the regiment left about midnight, and all were in position, without encountering any resistance, by shortly after daylight. No opportunity was given by the enemy to test the effectiveness of the position occupied.

Amusing incidents occurred on this march when the 1st Division and the 2d Division (represented by the 9th Infantry) were both marching along the same road at the same time. This was the only road north in that sector, and the same one the 9th Infantry had opened up two days before. The 1st and 2d Divisions had from the start been friendly rivals in achievements claimed; and full advantage was taken that night of the darkness and the close proximity. The remarks on both sides were free, pungent, and sincere. It was a rare opportunity for soldier wit and both sides took full advantage of it.

The entire success of the complete operations was due to the hardihood and staying power of the men in the ranks of the 9th Infantry. They had, of course, the incentive of seeing every minute the results accomplished. The official records did show, however, that the 9th Infantry entered the operations with an effective strength of 2600 men, which was less than that of any other regiment in the Division. And its casualties totaled 923 killed and wounded, and 62 missing. With this loss—greater than any other similarly-sized unit suffered—it yet had more men

present for duty at the close than any other. This speaks stronger than words of its morale. To command that regiment then was an inspiration.

Our only regret was that we could not continue forward after November 6th. No enemy was in our front either towards Carignon or towards Sedan, at least in so far as our patrols could determine. Three days later hostile detachments with machine guns could be seen returning from the direction of Carignon. These opposed later on the crossing of the Meuse, but on November 6th the coast was clear. On that date I fully believe we could have reached the outskirts of either Sedan or Carignon. How long we could have stayed is another question. Lack of supplies, food, and ammunition, and of artillery support, were the reasons given for discontinuing further advance toward Carignon; and the 1st Division had taken over the job in the direction of Sedan.

R. O. VAN HORN,
Brigadier General.

OPERATIONS OF COMPANY H 9TH INFANTRY NOVEMBER, 1918

On the 28th of October, 1918, Company H, 9th Infantry, 2d Division, is assembled in a small woods about a mile south of Exermont, France. (See Figure 38.) A general officer is addressing the company on the eve of a new battle; and as he speaks, the sounds of war to the north form a grim, rumbling accompaniment to his remarks. With his first words the general praises the regiment, and its record won in many wars. And then he speaks of what we're going to do in a day or two. The men listen closely.

"Good soldiers never get tired", he tells us. "They can always advance another step and fire another shot."

Some of us already know a lot about that. The regiment had been relieved on October 10, after ten days' fighting in the Champagne sector during which the casualties were roughly a third of the troops. Then the regiment marched 75 kilometers to a rest area, where it received replacements. Next came an intensive training period to teach the new men how to load and fire their rifles. This accomplished, the regiment moved forward again and, after another three-day march, was now in reserve behind another American division, which was occupying positions around Sommerance.

The general continues his speech: "The division which you are to relieve here has failed in its mission. You are to carry on where this division has failed. Do not expect relief or ask for it. Do not expect your rations on time, for they probably won't arrive. You are members of one of the greatest divisions of the American army. I have great confidence in your success."

At that moment the strength of Company H was three officers and 217 enlisted men. There were soldiers who barely knew how to take the canvas covers off their rifles; soldiers who had been six weeks in uniform; soldiers who wondered because the artillery duds weren't round like the cannon balls on the courthouse lawn back home. But there were also soldiers who had shown in battle the finest

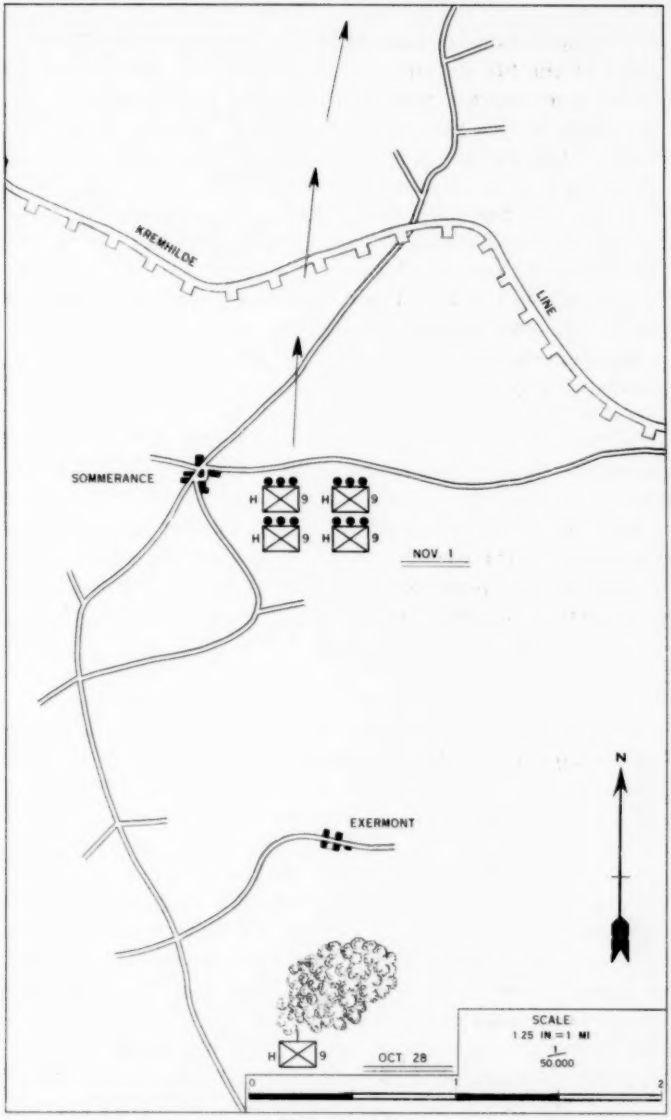
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FIGURE 38

of leadership and courage, soldiers who had been in every action of the 9th Infantry since the days of the Boxer rebellion, and soldiers who had followed their leaders without question. It was my privilege to be second in command of this company and later to command it.

The regimental commander was Colonel R. O. Van Horn, an officer of the old school and his second in command was Lieutenant Colonel Milo C. Corey, another old regular. The battalion commanders were all officers of less than two years' service and the company commanders had had about the same amount of experience.

The general came to the end of his talk: "I have great confidence in your success. I know you will not fail. Goodbye! I'll see *some* of you when you get back!" He gave us a stern farewell salute, stepped into his limousine, and was gone. Pondering his remarks we returned to our foxholes in the woods.

We knew our regiment had been chosen to be in the spearhead of the attack against the Kremhilde Line. This strong German position ran roughly east and west, a half mile north of Sommerance. Other units had tried to take it but had failed. Now, it was our job.

* * * * * * *

At 7:00 AM, October 31, Field Order No 49, 2d Division, assigned the 9th Infantry to the division reserve. Paragraph 3(i) directed it to follow "the 4th Brigade (Marines) at about one kilometer, occupying successive covered positions". A division G-3 memorandum of the same day announced "D" day as November 1, and "H" hour as 5:30 AM; and the Brigade field order directed our regiment to follow the 6th Marines in column of battalions echeloned in depth. This order placed special emphasis on flank protection. Memory fails me as to the manner and time of issuance of the battalion order. I do remember, however, that the officers and noncommissioned officers of Company H had ample opportunity on the afternoon of October 31 to study a map on which our jump-off positions and our objectives were shown.

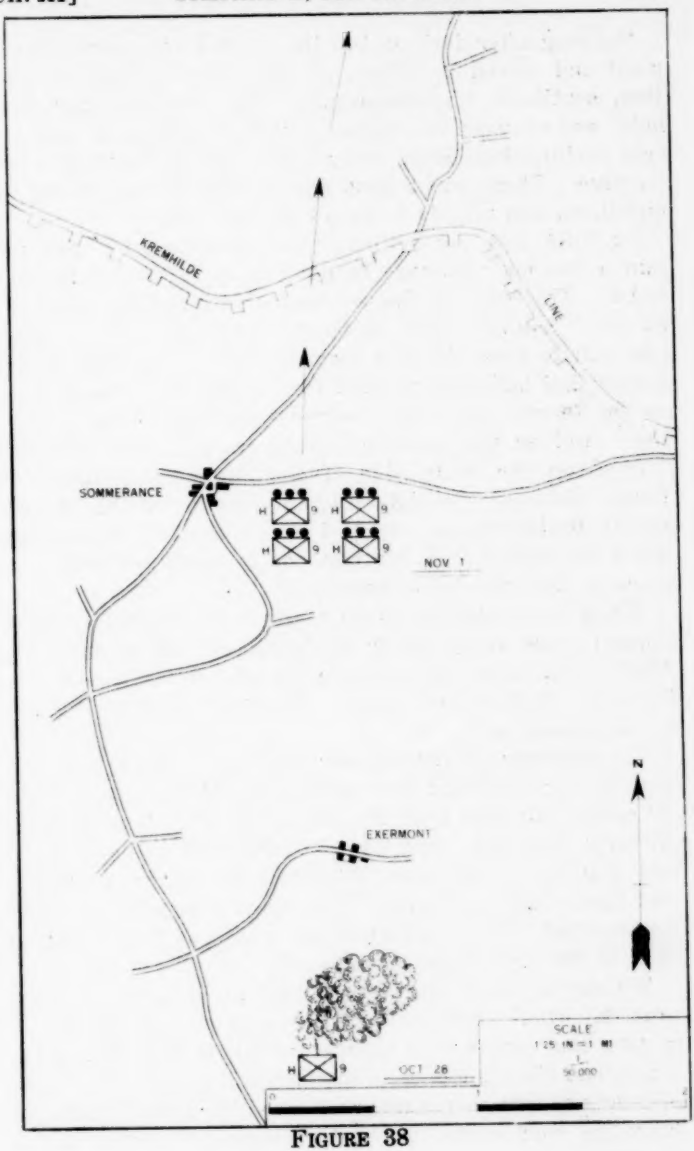
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FIGURE 38

Not long after dark we left the wooded area below Exermont and moved in column of twos to the jump-off position, southeast of Sommerance. The company dug foxholes and crawled into them; but dampness, cold, and enemy shelling kept sleep away. Men and officers all were on edge. There was a good deal of talking and asking of questions, and nobody knew all the answers.

By 3:30 AM our artillery and machine guns had begun a two-hour barrage in accordance with the division order. This was the famous concentration of fire that used every available gun to blast a path for our advance. Our spirits were still low from the gloomy picture of the future that had been painted for us, but they rose a little as the German positions received their tremendous pounding. And as the barrage neared its end, the company formed on the south side of the Sommerance-Romagne Road. We were the right leading company of the 2d (reserve) Battalion and occupied a frontage of 500 meters. We were formed with two platoons in depth and with platoons in line of combat groups.

While we waited for 5:30 to come the enemy artillery seemed to be doing plenty of firing as well as our own. Much of his shelling was directed at rear areas—including ours. But we were lucky. The heavy shelling brought us no casualties.

The company did not actually begin to advance, however, until 8:15. But from then until 2:00 PM we moved steadily north. By that hour the Marines ahead of us had taken their objective, "had the situation well in hand," and had dug in. There was little shell fire as we advanced, and again not a casualty. We were now along a road southeast of Chenery (Figure 39) where we dug ourselves in with the rest of the battalion.

We stayed where we were all that night and until noon next day (2 November). At 1:00 PM an order came directing the regiment to relieve the 5th Marine Regiment, which had the right half of the division sector. We were all ready to carry out this order when, at 8:00 PM, the 2d Battalion commander received a change of orders in the

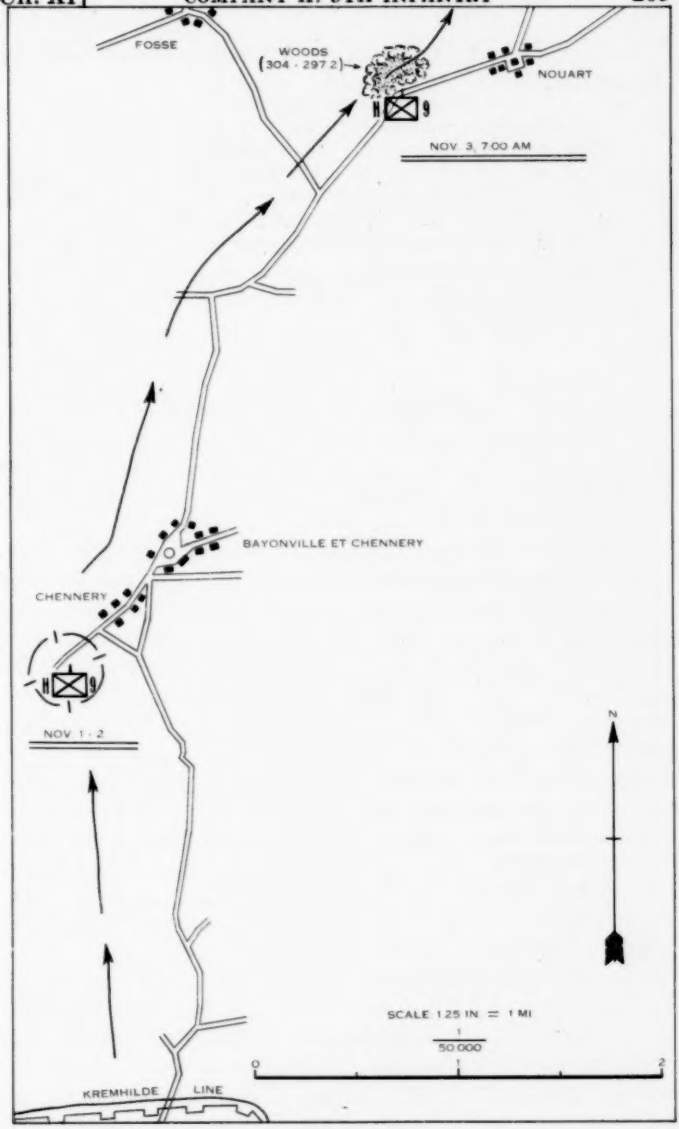
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FIGURE 39

following message from the regimental commander at Bayonville:

1. The enemy is in full retreat.
2. This division pursues. This regiment, covering the right half of the division sector, advances to the heights north and west of Nouart, forming for attack in the following order—1st Bn, 2d Bn, and 3d Bn.
3. The 2d Bn will proceed by marching with proper security by the most convenient route to woods 304-97.2.
4. All other details as per verbal orders.
5. This PC stands fast.

Van Horn,
Colonel.

Instead of merely relieving the Marines we were to pass through their lines on into enemy territory. Later orders set the time for the attack at 5:30 AM, 3 November and designated the line of departure as "the Division Exploitation Line" (Nouart—Fosse)—a line two whole miles in front of the line of Marine outposts! (See Figure 39.) The enemy was holding in front of the division we knew, because we were still receiving a substantial amount of shell fire. The terrain to the front was broken, wooded, and unknown to us, and our advance had to be made in the dark. We could not move up in battle formation, and arrive in time or in condition for the jump-off. Hence the regimental order meant only one thing: a march in column straight out through the Marine outposts into German territory!

We felt in our hearts that there must have been some terrible mistake. But we were wrong, and later freely admitted it. However, it is not difficult to imagine how we felt when we marched off toward the enemy at 8:30 PM in a column of squads.

The 1st Battalion headed the column as advance guard and we came next. At the Marine outposts we changed to a column of twos and plunged on out through the mud until we reached the road leading to Nouart. Here an enemy one-pounder crew began to shell the road, guessing correctly that some kind of movement was going on. But again Company H came through without a casualty.

At daylight, 3 November, the company formed in combat groups, and at 7:00 AM left the woods to the south of Nouart and advanced across country to a position northwest of Champy Haut. (See Figure 40.) This time our battalion was in support of the 1st Battalion.

As we moved forward the German resistance stiffened. We began to get a few casualties—some of them from machine guns, whose crews came out of their holes and fired at us from the flank. Those that we could silence without interrupting our advance we put out of business. But the others we left for units on our flanks and in our rear to handle.

We also began to pick up prisoners. They were more than astonished to see us. Our night march had advanced us a full five miles farther than they expected us to be. In fact, their artillery at the very moment was pounding the areas five miles to the southwest where they thought we were just jumping off. We even captured prisoners who were going to their own rear, and had thought themselves safe from any risk of capture at least until the evening of the day.

By 10:00 AM we reached a position on high ground south of Bois de Belval and west of Champy Bas. Here we met a determined resistance that definitely stopped our advance for the day. Apparently, our artillery was having a hard time keeping up with us, for we were getting no support. A battery of German 77's was sniping at us freely from the south edge of Bois de Belval, and those woods also seemed filled with machine guns. Company H received orders to deploy on the right of the 1st Battalion in order to fill a gap between it and the 98th Division operating on our right; and as soon as we got there we were glad enough to dig in without loss of time.

It was the middle of the day before our artillery registered on the source of our difficulties. But as soon as shells began to fall on the south edge of the Bois de Belval there was a noticeable slackening of hostile machine-gun fire. The 77's, however, kept at us all day long, causing most of our many casualties in this position.

In the early afternoon, too, the German guns began to get a good deal of help from our own artillery, whose fire fell short and gave us some additional casualties. The only relief from our misery during the next hour or two was supplied by our artillery liaison officer. He was kept just as busy as we were, dodging his own shells as well as those of the enemy.

While we were thus amusing ourselves the regimental commander and his staff were studying the situation and the map of the ground to our front. Just ahead, of course, lay the Bois de Belval, at that point about three miles deep. Within the woods, and roughly a mile from its south edge, was a pond about half a mile wide. Smaller ponds lay on each flank of the big pond and a little closer to us. Flowing in and out of these ponds was a network of numerous small streams which, with the ponds, made the terrain in front of the regiment extremely difficult of passage if not impassable.

There was, however, a single road to the north within the 9th Infantry sector. Only by marching five miles along that road could the regiment avoid the wooded region of ponds and streams.

Colonel Van Horn considered all this in making his decision. He also pointed out what was likely to happen if we made a frontal daylight attack upon the woods. At Belleau Woods in June, the Marines had lost 5,000 men. It was plain enough that here, too, the capture of the woods would be no easy task; and that every hour the attack was delayed would make the job more difficult: for the Germans would have that much more time to organize their defenses.

The regimental commander's final decision, which embarked us on one of the most daring exploits of the war, is best shown in his message to the Commanding General 3d Brigade:

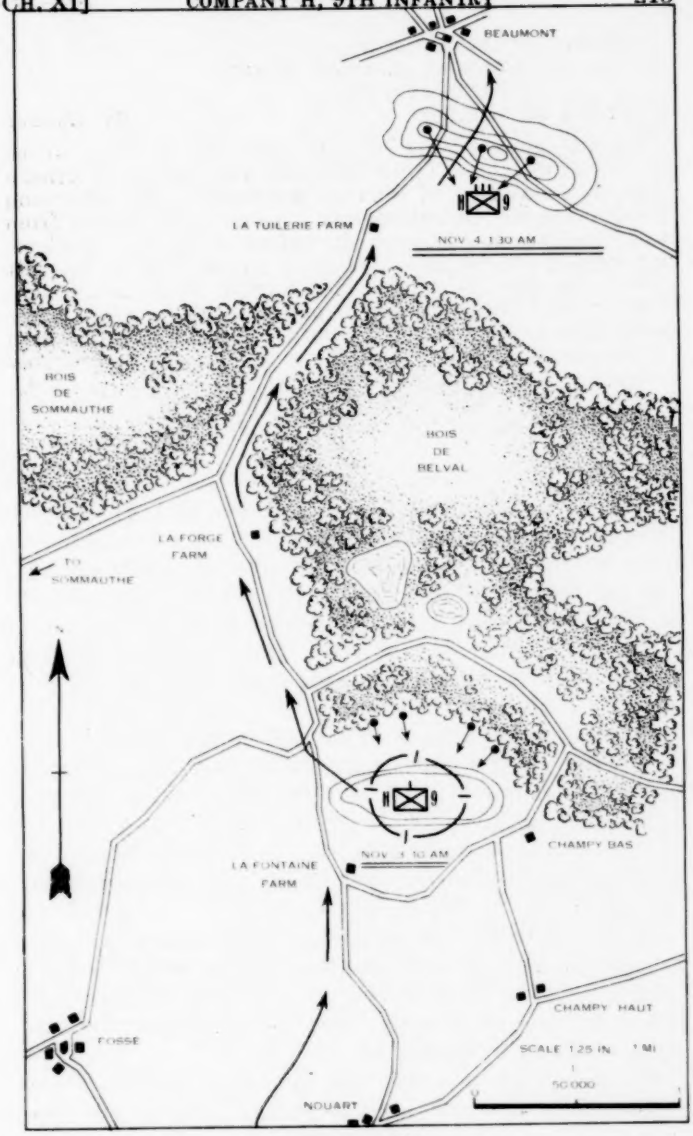

BEAUMONT
LA TUILERIE FARM
NOV. 4 1.30 AM
BOIS DE SOMMAUTHE
BOIS DE BELVAL
LA FORGE FARM
TO SOMMAUTHE
NOV. 1 10 AM
LA FONTAINE FARM
CHAMPY BAS
CHAMPY HAUT
FOSSE
NOUART
SCALE 1.25 IN. = 1 MI
1 50,000

FIGURE 40

From: CO 9th Infantry
At: La Fontaine Aucronq Ferme
3d November, 1918
To: CG 3d Brigade By Runner

Machine-gun and artillery fire still coming from woods in our front. We could advance and occupy northern edge of woods east of Bois de Sommauthe this afternoon in my opinion. Objective would be eight kilometers from here and we could reach it before midnight. Believe, however, it can be done. If done the division on the left should advance as far as Sommauthe with detachment holding road fork one and a half kilometers north. We could take and hold edge of woods three kilometers south of Beaumont. Enemy is holding at Beaumont, probably occupying to line of high grounds one and a half kilometers south. Will await instructions this point. 23d reports itself on our left occupying objective.

Van Horn
Colonel.

This message sent, an order soon came back (1:45 PM) ordering the simultaneous advance of the 9th and 23d Infantry through the Bois de Belval on parallel roads. But the road assigned to the 23d was found to exist only on the map; hence amended orders directed the 23d to follow the 9th on the only road. Even more boldly than before we were to march forward into the enemy's very midst.

As soon as the brigade order came, battalion commanders assembled at La Fontaine Farm where they received verbal orders for the march. The 3d Battalion, sending out a small advance guard, was to lead. The 2d and 1st were to follow without distance. We were to march directly through the woods on the road, and establish an outpost to guard the exit on the far side.

At 3:00 PM the battalion commander issues the order to abandon our present positions. At 4:00 we form in column of twos on the road, H Company in rear, with orders to keep close to Company G just ahead. It is almost dark and raining hard.

We have been cold and wet all day. There has been neither sleep nor rest; and there has been no hot food. Only a little of our reserve ration is left. We stand in the

mud of the road dreaming, between shivers, of a machine-gun bullet or a nice little sliver of high explosive in the arm or leg, or anywhere where it won't hurt too much. Just enough to send us back to warmth and food and beds. Are there such things as warmth and food and beds? Or are there only shells and mud and rain?

But we're forgetting! "Good soldiers never get tired. They can always advance another step and fire another shot!" Good soldiers never get tired. Good soldiers never get hungry. Good soldiers never get cold. Good soldiers never . . . they can always . . . another step . . . another shot!

Anyway, the Germans over there in the woods don't see us. We're lined up on the road, and there's no firing at us in particular.

We move off. One column of files takes the right ditch of the road and the other the left. It is slow going but we keep moving. There are no patrols on our flanks and only a small advance guard ahead of us. There is no sound of talking except at rare intervals when our German-speaking point challenges some enemy in the darkness.

There are no lights until we begin to pass German guns firing from positions a short distance from the road. The flashes and the night-lighting devices of these fellows help us to glimpse our way as we stumble along the ditches. They are probably firing away hard at the positions we crawled out of to go on this crazy march. We leave most of these guns alone and keep on past them into the woods.

Soon prisoners begin to move back through the company. They increase in numbers. Their going is easier than ours, for they have the middle of the road. Often there are more of them than of us. "Schweinhund" flung at them brings no answer.

A German soldier comes running through the woods toward the column. He doesn't see that we are enemy until he is close. Then he stops still and screams at us in German, "Don't shoot! Don't shoot!" over and over again. Somebody from the battalion tells him in his own language to shut up. He keeps on yelling "Don't shoot! Don't

shoot!" He makes enough noise to be heard in Berlin, and only yells louder at every effort to shut him up. Finally, somebody in the column does shoot him. He is quiet now.

The farther we go the harder it is to shove our way past the multitude of prisoners. We fall over them lying asleep or dead in the mud. And at the shortest halt we fall and sleep beside them. Some men sleep while they march, and are pushed staggering on by those in rear. Fifteen years from now a man named Ripley will put that in the paper. "Good soldiers never get tired" . . . advance another step . . . but don't fire any shots unless it's absolutely necessary . . . you're not hungry . . . you're not wet . . . you're not tired . . . it's just your imagination.

We creep farther and farther into the forest. We pass La Forge Farm, a clearing where there is a German ration and ammunition dump. There's ammunition left but the food is all gone . . . didn't want it anyway . . . "good soldiers" . . . never . . . hungry!

At 1:30 AM the black darkness began to fade and we stumbled out into open country to reach our objective and begin its organization. The rain filled our foxholes as fast as we could dig them. But as fast as we dug them we fell into them asleep. We had had four days and four nights without the four hours sleep that even Napoleon needed. But we weren't Napoleons—just "good soldiers who never got tired".

About 2:30 a runner found me: "Sir, you are detailed as officer of the day!" "Officer of the day?" Yes, it was true. Sentries had to be posted to prevent a possible night march by the Germans through our lines. And I was "it". Luck of the Irish!

Shortly after that, food came up. The men got up from their water-filled foxholes, ate, and dropped back into them again.

But with the first light of dawn they began to stir about, trying to warm their aching bones. A little more light, however, and the moving of men brought machine-gun fire from the north. And as the morning fog lifted,

the fire became more and more intense, pinning us to the ground.

One platoon gets orders to move to a position about five hundred yards east of La Tuilerie Farm, in order to protect the regiment's right flank. But this is a tough spot, no sooner occupied than enemy machine guns pour enfilading fire upon it from the ridge. The cries of wounded and dying are soon heard and these increase rapidly in number. One soldier prays fervently and continually, at the top of his voice. The first aid men are all gone, and we can find no medical officer. So we dress wounds the best way we can.

The cover is better to the front of our foxholes. We crawl forward. We can't dig; but we make every bump on the ground work overtime protecting us. A fox-terrier —some soldier's pet, he must be— tries to crawl under me. Not a chance, fellow, not a chance! There isn't room enough between me and the ground for a message blank.

What the devil are we going to do? We can't stay *here* all day!

At this time the regimental commander was at his command post in rear, and Lieutenant Colonel Corey, who had supervised the night march, was with the regiment. With him also was Major Hanford MacNider, the acting regimental adjutant. Colonel Corey, after sizing up the situation, directed the battalion commanders to report for instructions at La Tuilerie Farm. He had decided that the ridge to our front must be taken, and accordingly issued an order for the attack to begin at 10:30 AM. The 5th Machine-Gun Battalion was to support the attack from our present front lines, through gaps that were to be left between the assault companies. The Howitzer Platoon was to furnish support from near La Tuilerie Farm.

The battalion commander returns and issues his order to the platoon and company commanders.—One platoon leader asks whether his unit must take part in the attack. He says he has had fourteen casualties so far during the morning. The answer he receives should leave no doubt in his mind!—

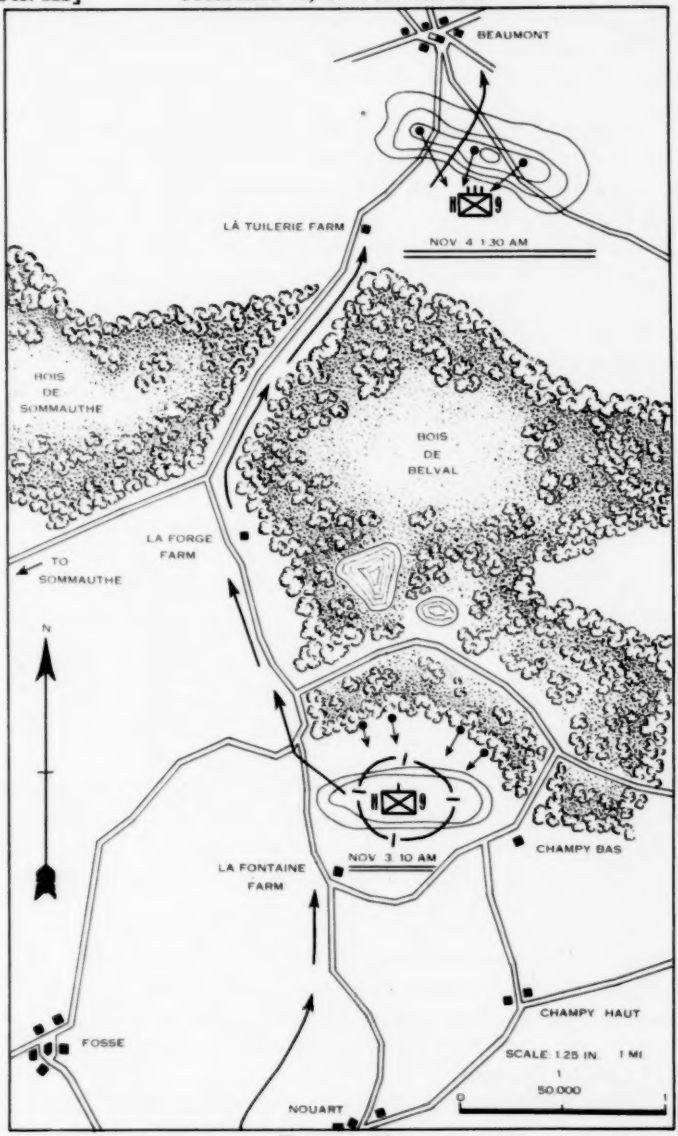
Ten thirty comes, and all hell breaks loose. Our machine guns are trying to tear the top off the ridge where the enemy is; and he is doing his damnedest to make any advance impossible for us.

Our Stokes mortar goes into action in rear of the company position. Its crew has three shells left. These pop off in the general direction of the ridge and explode without doing any apparent damage; and then the mortar is through business for the day.

We start up the hill in line of skirmishers with five pace interval. We are not firing—just covering ground as fast as we can. We are getting shells from the front, from the right rear, and from the left rear; and machine-gun fire from the ridge ahead. But in half an hour (11:00 AM) we're at the top of the ridge and on our objective.

As we come within fifty feet or so of two machine-gun nests, the crews hold up their hands and cry, "Kamerad!" Our soldiers close in on them and strip them of every button and ornament, forgetting the war in their desire for souvenirs. Not far to the northeast is a group of at least a hundred Germans disappearing into a woods. A perfect target! But before the men can be pried away from their captives, the opportunity is gone. We send the prisoners to the rear, finally; and then take over their foxholes for our own use.

A low-flying German plane comes over the top of the ridge, circles two or three times, and drops a green flare. In less time than it takes to tell it this signal brings a smashing barrage square on top of us. Casualties begin to mount up. The company commander thinks we should pull back to the reverse slope of the hill. I disagree, remembering that there is an officer of the company already in arrest for "withdrawing" in a similar manner not long ago. That's my only reason, however! The company commander decides to notify the battalion commander of our difficulties, and the message goes back. In a few minutes the messenger returns with an order for us to withdraw to the reverse slope, but to leave two outposts to watch the enemy movements.


BEAUMONT
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LA FONTAINE FARM
CHAMPY BAS
CHAMPY HAUT
FOSSE
NOUART
SCALE 1.25 IN. 1 MI
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FIGURE 40

The capture of the ridge brought us ten prisoners and two machine guns. Our casualties numbered about forty.

OPERATIONS FROM NOVEMBER 4TH TO 10TH

From the 4th till the 6th, we occupied the position near La Tuilerie Farm. On the 6th a movement forward was ordered, and we marched from our position about 7:00 AM. Moving in column of twos, we reached the northern outskirts of Beaumont before anything happened. (Figure 41.) There we encountered heavy shelling which caused us ten casualties. We kept on going, however, until we reached the Bois de Hospice. There we dug in, under cover of the woods, taking advantage of all available cover we could, without sacrificing our field of fire and observation. Here we stayed until November 10th.

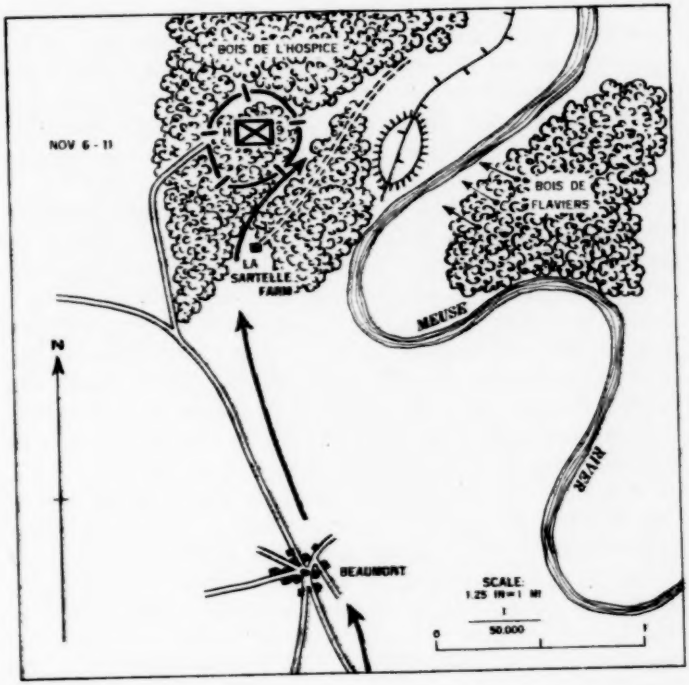
THE BRIDGING OF THE MEUSE

On the afternoon of the 10th the battalion commander sent for the officers of Company H to report to him at La Sartelle Farm. He told us that we were to help Company G, and Companies A and B, 2d Engineers, build a bridge over the Meuse near the Bois de Flaviers. We were to be a carrying party. It looked like another tough job.

Taking our rifles and ammunition along, we pushed forward to begin the job. Our route took us through the Bois de Hospice along an improved road that was in perfect condition. There wasn't a single shell hole in it. And no shells were falling. Everything was quiet—much too quiet, it seemed to us.

On coming out of the woods we moved off the road to follow a small ravine down to the Meuse, and halted at a railroad fill, which was four or five hundred yards from the river bank. Here, under the supervision of an Engineer officer, we unloaded wagons containing sections of rafts for the two bridges.

These sections were simply made, of logs held together by skids. These sections had to be lashed together to


BOIS DE L'HOSPICE
NOV 6 - 11
H
9
BOIS DE
FLAVIERS
LA
SANTELLE
FARM
MEUSE
N
RIVER
BEAUMONT
SCALE:
1.25 IN = 1 MI
1
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1

FIGURE 41

form the bridges. By 7:00 PM this work was done and the bridges were ready to shove down the bank and across the river. In another half hour, with two hundred men working each bridge down the bank and across, we had almost spanned the stream at two points some fifty yards apart. Then, however, our own troops commenced a weak and almost intermittent fire—coming, nevertheless, from both machine guns and artillery—apparently for the purpose of covering the river crossing.

All day up to that moment, we had worked under intermittent machine-gun fire from the German side of the stream. This fire, however, had caused no casualties, owing to the fact that we had considerable protection from it while working. Except for a couple of soldiers who had been frightened enough to "disappear", the company had been able to complete its preparations on the bank with little regard to the hostile bullets. But now that the bridge was almost across the stream without the loss of a man, the covering detachment saw fit to give the alarm.

It worked, all right! The Germans on the other side of the Meuse immediately opened up with all they had. More machine guns than we thought were within a mile began to spray the river and its banks. German flares began to go up. One of them dropped squarely in the middle of the group working on our bridge. It was followed immediately by a green flare. This brought a heavy artillery barrage over the area but our working party continued to be lucky. Soon, however, the greatly increased machine-gun fire caused casualties. But the faster the Germans fired, the faster Company H worked. About 8:30 the company commander was hit and joined the mounting casualty list. At 9:00, however, the dirty job was done and the Marine units that were to make the crossing and had been waiting under cover of the railroad fill for us to finish, began to file across.

We then started for the battalion command post, retracing the forest road by which we had come. Its condition was unbelieveable. The German artillery barrage had torn it to pieces. Moreover, a battalion of the 356th

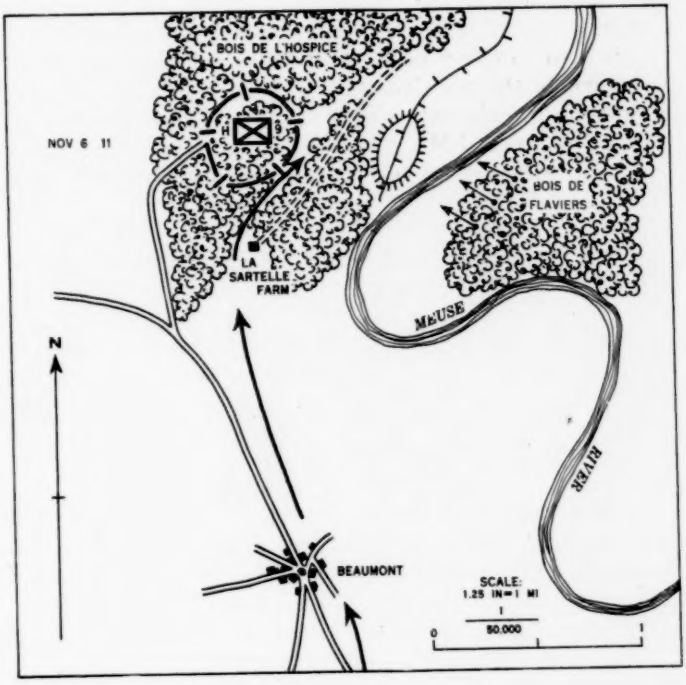
BOIS DE L'HOSPICE
NOV 6 11
BOIS DE FLAVIERS
LA SARTELLE FARM
MEUSE
RIVER
N
BEAUMONT
SCALE:
1.25 IN=1 MI
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FIGURE 41

Infantry (90th Division), sent to support the Marines, had been caught squarely under the fire, and the road was filled with dead and dying. Our return trip was a ghastly march.

When we reached La Sartelle Farm we received orders to return to the positions in the Bois de Hospice. There we stayed in comparative quiet until the afternoon of November 11 at 4:00 PM. At that time we were relieved and returned to Beaumont to prepare for the march into Germany.

* * * * * *

Three officers and 217 enlisted men began the eleven-day action with Company H, 9th Infantry. When the Armistice was declared, one officer and 77 men were left. Except for a few who were evacuated because of influenza or dysentery, the difference consisted of killed and wounded.

DISCUSSION

In these final eleven days of the war Company H experienced almost every conceivable phase of tactics. From the attack of fortified positions it reverted to open warfare. It pursued an enemy who was routed at times. But, again, it fought against a stubborn rear guard action, strong in machine guns and not lacking in artillery. It advanced with artillery preparation and without it. It suffered from its own artillery falling short. It participated in a river crossing. It held a defensive position during a lull in the battle. It participated in two night marches through the enemy lines.

In the beginning, the company was a mixture of veterans and untried draftees. Two of its officers had commanded platoons and companies in previous engagements, and one was new to actual war. But the talk given by the general officer before we entered battle had a very depressing effect on all officers and enlisted men alike. It was not soon forgotten.

The first two days of the operation were of immeasurable help to the company; for officers and noncommissioned officers had a chance to learn the character of the replacements and teach them many things that served in good stead after they came in contact with the enemy. The new men were close enough to the war to get a good idea of it and yet suffer little. Traveling along for those two days with very few casualties heightened the morale of the whole unit.

Throughout the eleven days the excellent discipline and the indifference to danger of the veterans of the company were invaluable for whipping the replacements into line.

The success of the night marches was the result of initiative and daring. The first night march was so utterly unexpected and so bewildered the Germans that they did not know what was coming next. Although the second night march took place without any flank protection whatever, it was justified in view of the circumstances under which the march was made. Had covering detachments attempted to move along our flanks it is highly probable that most of them would have become lost and that our own troops would have frequently fired into each other. There is no doubt that a daylight attack through Bois de Belval would have increased our casualties and lost much time. And delay would have given the Germans more opportunity to fortify their positions farther to the north.

The situation on the northern edge of Bois de Belval on November 4 was serious and many casualties were suffered owing to the failure of our howitzer platoon to function properly, especially as to ammunition supply. On the other hand, our artillery was having a difficult time keeping up with us and can hardly be condemned.

German planes attacked us almost at will and, although they did little direct damage, their information to their own artillery must have been excellent, and we suffered accordingly. Not more than three of our own planes were sighted during the eleven days of fighting.

The proposed action of the company commander to withdraw, after taking the ridge north of Bois de Belval on

November 4, was one that might have proven disastrous if it had been carried out at the time. The movement of one unit to the rear might well have precipitated a general withdrawal and caused the loss of the ridge.

The weak artillery and machine-gun barrage used to support the crossing of the Meuse on the evening of November 10 was not only untimely but worse than none at all. The obstacles presented by the Meuse and the dense woods to its east were such that only a heavy concentration could be of value. A weak one did no more than to disclose our intentions to the enemy.

These, to my mind are the principal lessons to be gained from the experience of this varied action:

If green men are mixed with well-disciplined, seasoned veterans a unit will function well.

In the pursuit of a defeated enemy, speed and daring are necessary to prevent that enemy from perfecting his defenses farther to the rear.

Friendly artillery fire falling on our own troops is one of the worst possible causes of lessened morale.

Howitzer platoons should save their ammunition for targets of opportunity.

The withdrawal of units after they have taken their objective should not be considered except upon orders from higher headquarters.

Air corps units can greatly increase the morale of infantry by helping it combat hostile attack and observation planes.

Troops should not be kept in close formations on roads during an attack.

A weak artillery and machine-gun barrage helps only to disclose our intentions to the enemy.

CONCLUSIONS

The success of this company during the eleven days' battle from November 1 to 11 was due to the ability and initiative of its regimental commander, Colonel R. O. Van Horn, who, because of his accurate estimation of the sit-

uation, was able to order confidently tasks that seemed both suicidal and impossible; and to the fine work of the seasoned veterans of the company, who, by their courage and leadership, inspired the new draftees so that after two days they carried on like veteran soldiers themselves.